

ANNUAL MEETING
SOUTHERN CALIFORNIA
ACADEMY OF SCIENCES

May 14-15, 2004



California State University

Long Beach, CA.

Contents:

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General Information

Parking: Parking Lot 11 is nearest the Student Union. On Friday you will need to pay (\$1.75). It will be free on Saturday.

Food: There are several fast food outlets in the Student Union for Friday. Off campus restaurants are also nearby.

Student Awards for Best Paper and Poster

Undergraduate or graduate students working towards a degree who elect to participate are eligible for best paper or poster awards in several categories, the categories are;

E – Ecology and Evolution
F – Fishery biology
M – Molecular Biology and physiology
P – Physical Science

The American Institute of Fishery Research Biologists will present the awards in Fishery Biology. The Southern California Academy of Sciences will present the other awards.

Future SCAS Meetings

2005 – Loyola Marymount University
2006 – Pepperdine University

Membership

The academy is always seeking new members and members who would like to become more involved in our activities by serving on our Board of Directors. The board meets once a month to plan and direct the societies activities, which include the annual meeting, publication of the bulletin, offering financial support to graduate students, and operating a Research Training Program for high school students.

PROGRAM ADDENDA - ADDITIONAL PAPERS

This is an addition to Contributed Papers, Friday.

- 4:20 148F **SEDIMENT GRAIN SIZE PREFERENCE OF THE ROUND STINGRAY (*UROBATIS HALLERI*)**
C.L. Penton and C.G. Lowe. California State University Long Beach, Department of Biological Sciences, Long Beach, CA, 90815

The round stingray, *Urobatis halleri*, is found along the beach area adjacent to the San Gabriel River mouth (SGR) in significantly higher densities than at adjacent beaches. Round stingrays often bury in sediments to conceal themselves from potential predators; however, little is known about sediment preferences for rajid fishes. To determine ray sediment preference of round stingrays we correlated sediment grain sizes at SGR and adjacent beaches with ray densities and conducted preference tests with rays in the laboratory. Sediment samples were collected from four areas along the Seal Beach coastline from the SGR to Surfside Beach (~ 1.5 km away), at different water depths over a 3 month period. Significant differences in sediment grain size compositions were found among the different sites, among different depth zones, and at different times ($p < 0.001$). Overall SGR had the finest grain sediments, while Southside Beach has the coarsest sediments. Ray substrate preference experiments were done in the laboratory using three different sediment grain sizes classes: fine ($< 0.25\text{mm}$), medium ($0.25\text{-}1\text{mm}$), and coarse ($> 1\text{mm}$). Rays significantly preferred fine grain sand over the medium and coarse grain sand ($p < 0.005$). These experiments show *Urobatis halleri* exhibits a significant sediment grain size preference which could influence their distribution in the Seal Beach area.

PROGRAM ADDENDA - DELETED PAPERS

The following paper will not be presented at Contributed papers, Friday

- 51 M 4:20 **GENE EXPRESSION OF AMYLASE BY *IN SITU* HYBRIDIZATION IN CARNIVOROUS AND HERBIVOROUS PRICKLEBACK FISHES: ONTOGENETIC, DIETARY, AND PHYLOGENETIC EFFECTS**
K.H. Kim and M.H. Horn. California State University, Fullerton, Department of Biological Science, Fullerton, CA, 92834.

The following paper will not be presented at Reef Ecology Symposia, Friday

- 32 2:40 **EFFECTS OF BEACH REPLENISHMENT ACTIVITIES ON NEARSHORE MARINE HABITATS**
L. Honma¹ and R. Rundle². ¹AMEC Earth & Environmental, 5510 Morehouse Dr., San Diego, CA 92121. ² San Diego Association of Governments (SANDAG), 401 B Street Suite 800, San Diego, CA 92101.

Acknowledgements

The Southern California Academy of Sciences wishes to acknowledge the following organizations and people for their support of the 2004 Annual Meeting.

MBC Applied Environmental Science

The Port of Los Angeles

We would also like to acknowledge the Harbor Association of Industry and Commerce for generously supporting our Research Training Program.

In addition, special thanks to **Dr. Raymond Wilson and Dr. David G. Huckaby**, whose work arranging facilities at CSU Long Beach was instrumental in our preparation for this meeting.

SCAS Board Members and Officers

Dr. Ralph G. Appy, President
Dr. John Dorsey, Secretary
Dr. Daniel Guthrie, Editor and Treasurer
Robert Grove, Past President
Dr. David G. Huckaby, Past President
Dr. Daniel J. Ponella, II, Past President

Dr. James Allen	Dr. Jonathan Baskin
Dr. Brad R. Blood	Dr. Jim Landry
Dr. Judith Doino Lemus	Dr. Karen Martin
Charles T. Mitchell	Dr. John Roberts
Gloria Takahashi	Dr. Raymond Wells
Dr. Raymond Wilson	Dr. Susan Yoder.

Southern California Junior Academy Board Members

Jason Hui	Tetsuo Otsuki	Robert Phalen	John Roberts
Martha Schwartz	Richard Schwartz	Gloria Takahashi	Dan Guthrie
John Dorsey			

Research Training Program: Judges

Robert Phalen, Chair	John Roberts	Gary Brookfield
Martha Schwartz	John Dorsey	Richard Schwartz
Jason Hui	Gloria Takahashi	Judy Lemus
Sue Yoder	Tetsuo Otsuki	Kristin Clark
Kathy Phalen		



Award for Best Student Paper in Fisheries Biology
Southern & Baja California, Mexico District

May 14 & 15, 2004

For the past 13 years the Southern & Baja California, Mexico District of the AIFRB has made cash awards to honor graduate and undergraduate student authors of fisheries-related papers presented at the annual meeting of the Southern California Academy of Sciences. Once again, we are pleased to award the efforts of student fishery research biologists at this 2004 annual meeting. A panel of AIFRB members will judge both oral and poster presentations of the students, and the winner will receive a certificate and a check for \$200.

PAST AWARD RECIPIENTS:

- 2003 MATTHEW NEILSON, CALIFORNIA STATE UNIVERSITY, LONG BEACH
- 2002 DANIEL CARTAMIL, CALIFORNIA STATE UNIVERSITY, LONG BEACH
- 2001 DARIN TOPPING, CALIFORNIA STATE UNIVERSITY, LONG BEACH
- 2000 KRISTINA LOUIE, UNIVERSITY OF CALIFORNIA, LOS ANGELES
- 1999 FREDRIK STENGARD, UNIVERSITY OF SOUTH FLORIDA, ST. PETERSBURG
- 1998 THOMAS EVEN, UNIVERSITY OF CALIFORNIA, SANTA BARBARA
- 1997 MASON POSNER, UNIVERSITY OF SOUTHERN CALIFORNIA/NATURAL HISTORY MUSEUM OF LA COUNTY
- 1996 INGO GAIDA, UNIVERSITY OF CALIFORNIA, LOS ANGELES
- 1995 SABRINA DRILL, UNIVERSITY OF CALIFORNIA, LOS ANGELES
- 1994 BLAISE EITNER, UNIVERSITY OF CALIFORNIA, LOS ANGELES
- 1993 JOSEPH CISNEROS, CALIFORNIA STATE UNIVERSITY, LONG BEACH
- 1992 REFIK ORHUN, SAN DIEGO STATE UNIVERSITY/HUBBS SEA WORLD RESEARCH INSTITUTE
- 1991 CHRISTINA SWANSON, UNIVERSITY OF CALIFORNIA, LOS ANGELES

AIFRB OBJECTIVES:

The chief function of the Institute is to foster professional development and performance of its members, and to recognize their competence and achievements. The Institute was incorporated to advance the theory and practice of fishery science and thereby to promote conservation and wise utilization of natural resources, and to establish and maintain high professional standards through recognition of achievement and adherence to a Code of Ethics known as *Principles of Professional Conduct for Fishery Biologists*. The Membership consists only of professional scientists with proven achievement in the field of fishery biology, and who may attain the rank of Associate, Member, or Fellow by meeting certain standards of achievement. Student memberships are also available. Presently, the Institute includes approximately 1000 fishery biologists from the United States, Canada, and Mexico, as well as other nations.

DISTRICT ACTIVITIES:

The Southern & Baja California, Mexico District of the AIFRB conducts three to five dinner business meetings each year that include a presentation of a topic of interest to the members. At the Fall meeting, the student winner of the AIFRB award is invited to present his or her talk to the local membership. The meetings are typically held at the El Adobe Restaurant in San Juan Capistrano, centrally located between Los Angeles and San Diego. In addition to making the student awards, the District occasionally sponsors symposia and short courses on pertinent fisheries issues, sponsors awards for excellence in fisheries work at both the student and professional level, attends the National Board of Control meetings, and maintains the national AIFRB web site (<http://www.iattc.org/aifrb/default.htm>).

CONTRIBUTING TO YOUR DISTRICT:

The Southern & Baja California, Mexico District of the AIFRB is a 501(c)(3) tax-exempt nonprofit organization (EIN 91-2145620). In planning your charitable donations for this year, please consider a donation to your District to help build our scholarship and award programs. Send a check payable to the Southern & Baja California, Mexico District of the AIFRB to: Joyce Andrew, Secretary-Treasurer, 3080 Hackett Ave, Long Beach, CA 90808.

For more information on local meetings and activities contact the District Director, Dr. Raymond Wilson, Department of Biological Sciences, California State University, Long Beach; (562) 985-5767; rwilson1@csulb.edu

Student Grants

The Southern California Academy of Sciences supports a program of Grants to graduate students. One stipulation for the winners is that they present their research at the following year's Annual Meeting. Last years award winners were

Diana Andres – poster session
Torrey Nybork – palenontology symposium
Stephanie Yelenik - poster session

Winners of Grants for 2004-05, and their projects, are as follows.

Tom Benson , California State University, San Bernardino
Molecular Ecology of Pygmy Nuthatches (*Sitta pygmaea*): Genetic
Differentiation Within and Among Mountain Ranges in Southern California

Kelly Connell, California State University, Fullerton
Dietary Response of Elegant Tern (*Sterna elegans*) to Changing Ocean
Conditions and Prey Populations in Southern California

Sarah K. Henkel, University: University of California, Santa Barbara
Physiological stress response of the intertidal kelp, *Egregia menziesii*
(Turner)Areschoug.



OFFICE OF THE PRESIDENT
CALIFORNIA STATE UNIVERSITY, LONG BEACH
1250 BELFLOWER BOULEVARD
LONG BEACH, CALIFORNIA 90840-0115
562/985-4121

May 2004

Dear SCAS Members:

Welcome to California State University, Long Beach! We are delighted to have so many professionals dedicated not only to scientific research but also to the encouragement of young scientists and students interested in science as a career.

This annual meeting serves to foster a network of scientists and those interested in science to promote the sharing of information and the encouragement of academic pursuits important to our community. The presentation of awards to deserving students is a tremendous way to recognize and inspire the next generation of scientific scholars.

This program will highlight the events and activities supported by the Academy. With great enthusiasm, I look forward to being a part of these exciting endeavors, and I gratefully anticipate the outstanding academic contributions that will continue to be advanced by your exceptional organization.

Sincerely,

A handwritten signature in cursive script, appearing to read "Robert C. Maxson".

Robert C. Maxson

President

California State University, Long Beach

**SOUTHERN CALIFORNIA ACADEMY OF SCIENCES
Annual Meeting, May 14-15, 2004, C.S.U. Long Beach**

FRIDAY, May 14, 2004

8:00 - 1:00 Registration,

Union Ballroom B
Marine Invertebrates
Break

Union Ballroom A

Union Ballroom C
Rocky Habitats
Break

Alamitos Room
Environmental
Break

11:00-11:30 Welcome, Grant Announcements, Wheeler Award

11:30-12:30 Plenary Speaker:
Dr. Donald Reish:
Expanded Ballrooms
Importance of Polychaetes

12:30-1:40 Lunch

Lunch

Lunch

1:40-3:00 Marine Invertebrates
Break

Pleistocene Paleontology
Break

Rocky Habitats
Break

Contributed Papers
Break
Contributed Papers

5:15-7:00 Poster Session and Wine and Cheese Social: Student Union Courtyard

SATURDAY, May 15, 2004

8:00 - 1:00 Registration

Union Ballroom B
Stress Responses in Fish
Break

Union Ballroom A
Molecular Ecology
Break

Union Ballroom C
Molecular Biology
Break

Alamitos Room

Science Lecture Halls 48,50
RTP Sessions (2)
Break

11:00 - 12:00 Plenary Speaker:

Dr. Walter C. Pitmann III: Noah's Flood: Myth or Historical Reality

Expanded Ballrooms

12:00 - 1:20 Lunch

Lunch

Lunch

1:20 - 3:00

Stress Responses in Fish
Break

Molecular Ecology
Break

Archeology
Break

Contributed Papers
Break

RTP Sessions (2)
Break

3:20-5:00

Stress Responses in Fish

Molecular Ecology

Archeology

Contributed Papers

RTP Sessions (2)

5:15-7:00

Wine and Cheese Social: Student Union Courtyard

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

Location: Union Ballroom B

Session: Marine Invertebrate Ecology and Marine Pollution Studies:

Honoring the Legacy of Donald J. Reish.

Chair: John Dorsey, Loyola Marymount University

- 1 8:20 **DON REISH'S ANNUAL MARINE POLLUTION LITERATURE REVIEW: FOUR DECADES OF MONITORING THE SCIENCE**
A.J. Mearns, Hazardous Materials Response Division, National Oceanic and Atmospheric Administration, Seattle, WA 98115 and P. N. Oshida, U.S. Environmental Protection Agency, Washington, D.C.

- 2 8:40 **VARIABILITY IN POLYCHAETES: REGENERATING RUBBER-BANDS?**
K. Fauchald, Smithsonian Institution, National Museum of Natural History, Department of Zoology, MRC 0163 Washington DC, 20013-7012,

- 3 9:00 **RAPID RECOLONIZATION OF INFAUNAL BENTHOS AT A DEEP-SEA DISPOSAL SITE.**
James A. Blake, ENSR Marine & Coastal Center, 89 Water Street, Woods Hole, MA 02543.

- 4 9:20 **SOFT-BOTTOM MEGABENTHIC INVERTEBRATE POPULATIONS AND ASSEMBLAGES OF THE SOUTHERN CALIFORNIA SHELF IN 1998**
M. James Allen¹, Doug Diener², Erica T. Jarvis¹, Valerie Raco-Rands¹, Christina Thomas³, Yvette Ralph³, and Don Cadien.⁴ ¹Southern California Coastal Water Research Project, Westminster, CA 92683; ²MEC Analytical Systems, Inc., Carlsbad, CA 92008; ³Orange County Sanitation District, Fountain Valley, CA 92728; ⁴County Sanitation Districts of Los Angeles County, Whittier, CA 90601

- 6 9:40 **ASSESSMENT OF COPPER EMISSIONS FROM RECREATIONAL VESSEL ANTIFOULING PAINTS IN SOUTHERN CALIFORNIA**
Kenneth Schiff, Dario Diehl, Southern California Coastal Water Research Project, Westminster, CA 92683Aldis Valkirs, Computer Sciences Corp., San Diego, CA 92110

- 146 10:00 **PROBLEMS WITH *PISTA* IN THE NORTHEAST PACIFIC (ANNELIDA: POLYCHAETA: TERESELLIDAE)**
L.H. Harris, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007

- 7 10:20 **DISCUSSION OF MALDANID NEPHRIDIA, AND AN EMENDED DESCRIPTION OF THE GENUS *PETALOCLYMENE* (ANNELIDA: POLYCHAETA)**
K.D. Green, MEC Analytical Systems, Inc.–Weston Solutions, Inc., 2433 Impala Drive, Carlsbad, CA 92008.

- 10:40 – 11:00 **BREAK**

- 11:00 – 11:30 **Welcome, Student Grant Awards, Wheeler J. North Award**

11:30 – 12:30 Plenary Talk : IMPORTANCE OF POLYCHAETES
Donald Reish, CSU Long Beach

12:30 – 1:40 LUNCH BREAK

**Session: Marine Invertebrate Ecology and Marine Pollution Studies:
Honoring the Legacy of Donald J. Reish.**

Chair: Alan Mearns, NOAA

- 8 1:40 BENTHIC POLYCHAETE COMMUNITIES AT THE MOUTH OF THE SAN FRANCISCO BAY
Dorothy Norris and Michael G. Kellogg; City and County of San Francisco, Public Utilities Commission.
- 9 2:00 USE OF REGIONAL DATA TO EVALUATE AND DEVELOP SEDIMENT QUALITY GUIDELINES
S.M. Bay¹, D.E. Vidal¹, and P.L. Myre². ¹Southern California Coastal Water Research Project, Westminster, CA, 92683; ²Exa Data and Mapping Services, Port Townsend, WA, 98368
- 10 2:20 DEVELOPING A WATER EFFECTS RATIO FOR AMMONIA IN FRESHWATERS OF LOS ANGELES
Jack Q. Word¹, David W. Moore¹, Ashli Cooper², and Mary Ann Irwin¹. ¹MEC Analytical Systems, Inc.; ²Larry Walker Associates
- 11 2:40 LIFE HISTORY CHARACTERISTICS OF *TEREDO NAVALIS* AND *TEREDO BARTSCHI* IN THE VICINITY OF A WARM WATER DISCHARGE: A CASE FOR MONITORING GLOBAL WARMING THROUGH CHANGES IN GEOGRAPHICAL RANGES OF MARINE SPECIES.
D.E. Morgan, Millstone Environmental Laboratory, Dominion Nuclear Connecticut, Inc., Waterford Connecticut 06385, USA

3:00 – 3:20 BREAK

- 12 3:20 THE ANTHOZOAN FAUNA OF OIL PLATFORMS NEAR POINT CONCEPTION, CALIFORNIA
John C. Ljubenkov. Dancing Coyote Ranch, P.O. Box 781, Pauma Valley, CA 92061
- 13 3:40 DEVELOPMENT OF AN EPIBENTHIC COMMUNITY (ANNELIDA: POLYCHAETA) IN AN ARTIFICIAL SUBSTRATUM AT VERACRUZ REEF SYSTEM, GULF OF MEXICO – AN EXPERIMENTAL APPROACH.
V. Díaz-Castañeda (1) & de León-González, J.A. (2) Departamento de Ecología, CICESE Km 107, Highway Tijuana-Ensenada, Apdo. Postal 2732, Ensenada, B.C., México vidiaz@cicese.mx (2) Facultad de C. Biológicas,

- 14 4:00 **FECAL INDICATOR BACTERIA IN TIDAL WATERS OF THE BALLONA WETLANDS.**
John H. Dorsey. Loyola Marymount University, Department of Natural Science, North Hall, Los Angeles, CA, 90045.
- 15 E 4:20 **AN ICP-MS STUDY OF CD, ZN AND CU ACCUMULATION IN THE BODIES, CYTOSOL AND JAWS OF THE POLYCHAETE, *NEANTHES ARENACEODENTATA*.**
Bernier, S. and Mason, A.Z. Department of Biological Sciences and Institute for Integrated Research in Materials, Environments and Society, California State University Long Beach, CA, 90840.
- 16 4:40 **REPRODUCTIVE BEHAVIOR OF THE MALE *Neanthes arenaceodentata* (ANNELIDA: POLYCHAETA)**
Donald J. Reish and Karin De Collibus, Department of Biological Sciences, California State University, Long Beach, CA 90840

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

Location: Union Ballroom A

Session: Pleistocene Paleontology

Chair: Mark Roeder, San Diego Natural History Museum

- 17 1:40 **THE GYPSUM RIDGE LOCAL FAUNA, AN EARLY PLEISTOCENE VERTEBRATE ASSEMBLAGE FROM TWENTYNINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA.**
Hugh M. Wagner Dept. of Paleontology, San Diego Natural History Museum. P. O. Box 121390, San Diego, CA 92112
- 18 2:00 **A LATE PLEISTOCENE (RANCHOLABREAN) VERTEBRATE ASSEMBLAGE FROM OCEANSIDE, SAN DIEGO COUNTY, CA**
K. A. Randall, H. M. Wagner, B.O. Riney, M.A. Roeder, Department of Paleontology, San Diego Natural History Museum, 1788 El Prado, San Diego, CA 92101
- 19 2:20 **PLEISTOCENE VERTEBRATES OF THE LOS ANGELES BASIN AND VICINITY (EXCLUSIVE OF RANCHO LA BREA): AN UPDATE**
Sherri M. Gust, Cogstone Resource Management Inc.
- 20 2:40 **A LARGE FOSSIL FLORA FROM THE PLEISTOCENE OLDER ALLUVIUM, TRIPLE M RANCH, CORONA, CALIFORNIA.**
L.H. Fisk^{1,2} and P.R. Peck². ¹Department of Earth Sciences, American River College, Sacramento, CA, 95841 and ²PaleoResource Consultants, 5325 Elkhorn Boulevard, #294, Sacramento, CA, 95842

3:00 BREAK

- 21 3:20 **DEPOSITIONAL HISTORY AND PALEOENVIRONMENT
RECONSTRUCTION OF A MIOCENE MAMMAL AND BIRD TRACK
SITE WITHIN BASIN FILL SEDIMENTS OF THE COPPER AND
COFFIN CANYONS, DEATH VALLEY NATIONAL PARK, CA**
T. Nyborg and P.H. Buchheim. Department of Natural Sciences, Loma Linda
University, Loma Linda, CA 92354.
- 22 3:40 **FOSSIL MARINE FISH FAUNA FROM A LATE PLEISTOCENE SITE
ON MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA.**
Roeder, Mark A., Department of Paleontology, San Diego Natural
History Museum, P. O. Box 121390, San Diego, CA 92112
- 23 4:00 **RECENT SURVEY WORK NEAR EL GOLFO DE SANTA CLARA,
SONORA MEXICO.**
C.A. Shaw¹ and F.W. Croxon III². ¹George C. Page Museum, Los Angeles, CA
90036 and² Western Arizona College, Yuma, AZ 85366
- 24 4:20 **EARLY RECORDS OF EXTINCT *BISON* FROM SOUTHERN
CALIFORNIA AND THE BEGINNING OF THE RANCHOLABREAN
NORTH AMERICAN LAND MAMMAL AGE**
Eric Scott, San Bernardino County Museum, Division of Geological Sciences,
Redlands, CA 92374
- 25 4:40 **RALPH B. CLARK REGIONAL PARK: AN UNTAPPED TREASURE
TROVE OF PLEISTOCENE FOSSILS.**
Lisa C. Babilonia. Ralph B. Clark Interpretive Center, 8800 Rosecrans Ave.,
Buena Park, CA, 90621.

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

Location: Union Ballroom C

Session: Rocky Reef Habitats

Chair: Daniel Pondella , Occidental College and Bob Grove SC Edison

- 26 9:00 SHOULD I STAY OR SHOULD I GONAD? SITE FIDELITY AND SEASONAL MOVEMENT PATTERNS OF CA SHEEPHEAD (*Semicossypus pulcher*)**
D.T. Topping, C.G. Lowe, Y.P. Papastamatiou, and J. Caselle; California State University Long Beach, Department of Biological Sciences, 1250 Bellflower Blvd., Long Beach, CA 90840, USA
- 27 F 9:20 THE FISH ASSEMBLAGES INSIDE AND OUTSIDE OF A MARINE RESERVE AT SANTA CATALINA ISLAND, CALIFORNIA**
Froeschke, John T. Nearshore Marine Fish Research Program, California State University, Northridge, Department of Biology, 18111 Nordhoff St. Northridge
- 28 9:40 RECOMMENDATIONS FOR A RESERVE IN LA JOLLA BASED ON PATTERNS OF HABITAT, DIVERSITY, AND OCEANOGRAPHIC CLIMATE.**
P.E. Parnell, C. Lennert-Cody, and P.K. Dayton, Scripps Institution of Oceanography, UCSD, La Jolla, CA, 92093-0227. CA, 91330.
- 28a 10:00 EFFECTS OF WARM WATER DISCHARGES FROM THE MORO BAY POWER PLANT ON HARD BOTTOM BENTHIC COMMUNITY STRUCTURE: FOLLOW-UP STUDIES TO DR. W.J. NORTH'S 1967/68 SURVEYS**
Scott Kimura, TENERA Environmental, San Luis Obispo, CA 93401
- 28B 10:20 GETTING READY FOR THE "BIG ONE": NATIONAL OILSPILL DRILL IN SOUTHERN CALIFORNIA AND ATTEMPTS TO REDUCE NEARSHORE IMPACTS USING DISPERSANTS.**
A.J. Mearns, Hazardous Materials Response Division, National Oceanic and Atmospheric Administration, Seattle, WA 98115
- 10:40 – 11:00 BREAK**
- 11:00 – 11:30 Welcome, Student Grant Awards, Wheeler J. North Award**
- 11:30 – 12:30 Plenary Talk : IMPORTANCE OF POLYCHAETES**
Donald Reish, CSU Long Beach
- 12:30 – 1:40 LUNCH BREAK**

- 29 1:40. **STATUS OF THE KELP BEDS OF ORANGE AND SAN DIEGO COUNTIES IN 2002 WITH A REVIEW OF THEIR STATUS THROUGH 2003**
Mike Curtis, MBC Applied Environmental Sciences, Costa Mesa
- 30 2:00 **THE SAN CLEMENTE ARTIFICIAL REEF – EXPERIMENTAL PHASE KELP WRACK STUDY RESULTS**
Robert Grove, Environmental Projects, Southern California Edison, P.O. Box 800, Rosemed, CA 91770
- 31 2:20 **GLOBAL MONITORING OF TEMPERATE REEF ALGAL COMMUNITIES**
Larry Deysher, Ocean Imaging, 201 Lomas Santa Fe Drive, Suite 370, Solana Beach, CA 92075, and Matt Edwards, San Diego State University.
- 32 2:40 **EFFECTS OF BEACH REPLENISHMENT ACTIVITIES ON NEARSHORE MARINE HABITATS**
L. Honma¹ and R. Rundle². ¹AMEC Earth & Environmental, 5510 Morehouse Dr., San Diego, CA 92121. ² San Diego Association of Governments (SANDAG), 401 B Street Suite 800, San Diego, CA 92101.
- 3:00 **BREAK**
- 33 3:20 **SIZE-DEPENDENT PREDATION ON TWO TEMPERATE-REEF FISHES: CAN CONFLICTING RESULTS FROM FIELD AND LAB STUDIES BE RECONCILED?**
M.A. Steele. Marine Science Institute, University of California, Santa Barbara, CA 93106.
- 34 3:40 **BIOGEOGRAPHY OF THE NEARSHORE ROCKY-REEF FISHES AT THE SOUTHERN AND BAJA CALIFORNIA ISLANDS**
Daniel J. Pondella, II^{1*}, Brooke E. Gintert², Jana R. Cobb¹, and Larry G. Allen³
¹Vantuna Research Group, Moore Laboratory of Zoology, Occidental College, 1600 Campus Rd., Los Angeles, CA 90041, ²Rosenstiel School of Marine and Atmospheric Science, Marine Biology and Fisheries Division, Miami, 4600 Rickenbacker Causeway, Miami, FL 33149, ³ Department of Biology, California State University, Northridge, Northridge, CA 91330-8303
- 35 4:00 **RECRUITMENT OF REEF FISHES IN THE SANTA BARBARA CHANNEL**
J.E. Caselle. Marine Science Institute and PISCO, University of CA, Santa Barbara, CA 93106
- 36 F 4:20 **TEMPORAL PATTERNS IN THE SETTLEMENT OF CRYPTIC REEF FISH**
Joshua B. Lindsay, Department of Biology, California State University, Northridge
- 37 4:40 **LARGE AND SMALL SPATIAL VARIATION IN CRYPTIC REEF FISH ASSEMBLAGES**
J.R. Cobb, Vantuna Research Group, Occidental College, 1600 Campus Road, Los Angeles, Ca. 90041

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

Location: Alamitos Room

Session: Environmental Modelling

Chair: Drew Ackerman, SCCWRP

- 38 9:00 RECENT DEVELOPMENTS IN AUTOMATIC CALIBRATION AND APPLICATION TO HYDROLOGIC MODELING**
Terri S. Hogue, Department of Civil and Environmental Engineering, University of California-Los Angeles
- 39 P 9:20 MODELING WATER AND NUTRIENT EXPORT FROM COASTAL WATERSHEDS IN SOUTHERN CALIFORNIA**
R.E. Beighley, A. Leydecker, and J.M. Melack, Institute for Computational Earth System Science, University of California, Santa Barbara, CA 93106.
- 40 9:40 NUTRIENT MANAGEMENT IN THE SAN JACINTO WATERSHED, CALIFORNIA**
Rick Whetsel, Mark Norton. Santa Ana Watershed Project Authority, Riverside, CA Andrew Parker, Stephen Carter. Tetra Tech, Inc., Fairfax, Virginia Hope Smythe, Xinyu Li. Santa Ana Regional Water Quality Control Board, Riverside, CA
- 41 10:00 HYDRODYNAMIC MODELING OF FECAL INDICATOR BACTERIA IN TALBERT MARSH BASED ON LOADS FROM URBAN RUNOFF, BIRD FECES, AND RESUSPENDED SEDIMENTS**
Brett F. Sanders[†], Feleke Arega[‡], and Martha Sutula^{††} Department of Civil and Environmental Engineering, University of California, Irvine. [‡]Ecosystems Research Division, US Environmental Protection Agency. ^{††}Southern California Coastal Water Research Project.
- 42 10:20 DYE DISPERSION IN THE SURF ZONE: MEASUREMENTS AND SIMPLE MODELS**
L. B. Clarke, J. Largier. Integrative Oceanography Department, Scripps Institution of Oceanography, University of California-San Diego, La Jolla, CA. D. Ackerman, Southern California Coastal Water Research Project, Westminster, CA
- 10:40 BREAK**
- 11:00 Welcome, Student Grant Awards, Wheeler J. North Award**
- 11:30 Plenary Talk : IMPORTANCE OF POLYCHAETES**
Donald Reish, CSU Long Beach

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

Location: Alamitos Room

Session: Contributed Papers

Chair: Tonny Wijte, CSU Long Beach

- 43 E 1:40 **SPATIAL AND TEMPORAL VARIATION IN THE TISSUE HALIDE CONTENT OF THE COASTAL SALT MARSH HALOPHYTE, *SALICORNIA VIRGINICA***
Y. J. Ralph, California State University, Long Beach, Department of Biology, Long Beach, Ca, 90840
- 44 E 2:00 **EFFECTS OF DISPERSAL ON LOCAL DISTRIBUTION OF THE GRANITE SPINY LIZARD, *SCELOPORUS ORCUTTI*.**
A.M. Fox and J.W. Archie. California State University, Long Beach, Department of Biological Sciences, Long Beach, CA, 90840.
- 45 2:20 **GEOLOGY AND PETROLOGY OF A MIOCENE DACITE DIKE SWARM AND COGENETIC VOLCANIC ROCKS, LITTLE CHUCKWALLA MOUNTAINS, CALIFORNIA.**
Angelique C. Hamane and Dave Mayo, California State University, Los Angeles, Department of Geological Sciences, 5151 State University Drive, Los Angeles, CA 90032.
- 47 P 2:40 **JOINT DYNAMICS OF THE EQUINE FORELIMB DURING JUMPING**
SS Huber, DF Hoyt, DJ Dutto, SJ Wickler Departments of Biological Sciences, Kinesiology & Health Promotion, and Animal & Veterinary Science California State Polytechnic University, Pomona, CA, 91768
- 3:00 – 3:20 BREAK**
- 48 3:20 **SUMMERTIME DISTRIBUTION OF THREE SPECIES OF ATHERINOPSID FISHES IN EAST-CENTRAL SAN FRANCISCO BAY**
A. Jahn, Port of Oakland and E. Jolliffe, U. S. Army Corps of Engineers, San Francisco District
- 49 F 3:40 **STANDARD AND ROUTINE METABOLISM OF KELP BASS *PARALABRAX CLATHRATUS***
K. Johnson. California State University, Long Beach, Department of Biological Sciences, Long Beach, CA, 90815.
- 50 P 4:00 **MASS SIZE DISTRIBUTIONS AND DRY DEPOSITION FLUXES OF TRACE METALS MEASURED IN THE LOS ANGELES AIR BASIN.**
Jeong-Hee Lim and Keith D. Stolzenbach, Department of Civil and Environmental Engineering, University of California, Los Angeles, Los Angeles, CA, 90095 Lisa D. Sabin and Kenneth Schiff, Southern California Coastal Water Research Project, 7171 Fenwick Lane, Westminster, CA 92683
- 51 M 4:20 **GENE EXPRESSION OF AMYLASE BY *IN SITU* HYBRIDIZATION IN CARNIVOROUS AND HERBIVOROUS PRICKLEBACK FISHES: ONTOGENETIC, DIETARY, AND PHYLOGENETIC EFFECTS**

K.H. Kim and M.H. Horn. California State University, Fullerton, Department of Biological Science, Fullerton, CA, 92834.

Southern California Academy of Sciences 2004 Session Schedule

Friday, May 14, 2004

**Location: Center Courtyard of the University
Student Union**

Session: Poster Session and Wine and Cheese Social

- 52 P A PETROGRAPHIC ANALYSIS OF A PALEOSOL IN THE LAS VIRGENES SANDSTONE, SANTA MONICA MOUNTAINS**
***E. Abeja, *P.C. Ramirez, *M. Banda, **H. Hernandez, *G. Noriega, *California State University Los Angeles, Department of Geological Sciences, Los Angeles, CA, 90032. ** University of Southern California, Department of Earth Sciences, Los Angeles, CA 90089**
- 53 P GEOCHEMICAL ANALYSIS OF THE RICARDO VOLCANICS, SOUTHERN EL PASO MOUNTAINS, CALIFORNIA**
Cami Jo Anderson and David R. Jessey, Department of Geological Sciences, California State Polytechnic University – Pomona, Pomona, CA, 91768.
- 54 E TESTING DIET SWITCHING AS THE MECHANISM FOR THE EVOLUTION OF STRICT HERBIVORY IN LIZARDS**
D. L. Andres and R. E. Espinoza. Laboratory for Integrative and Comparative Herpetology, Department of Biology, California State University, Northridge, Northridge, CA 91330-8303.
- 55 P A POSSIBLE ORIGIN FOR A PALEOCENE QUARTZ-RICH SANDSTONE ASSOCIATED WITH A PALEOCENE PALEOSOL IN THE SAN JOAQUIN HILLS, CALIFORNIA**
M. Banda, P. Ramirez, S. Leyva, and E. Abeja, California State University, Los Angeles, Department of Geological Sciences, Los Angeles, California 90032
- 56 E PUDDINGSTONE RESEVOIR PLANKTON POPULATION STUDIES, OCTOBER 2002-APRIL 2003**
F. M. Bell and S. V. Merritt, University Of La Verne, Department of Biology, La Verne California
- 57 E GENETIC DIFFERENTIATION WITHIN AND AMONG PYGMY NUTHATCH (*Sitta pygmaea*) POPULATIONS IN SOUTHERN CALIFORNIA**
T.A. Benson and A.E. Metcalf. Department of Biology, California State University, 5500 University Parkway, San Bernardino, CA 92407
- 58 E *E. COLI* AND *ENTEROCOCCUS* IN SURFACE WATERS OF EAST SAN GABRIEL RIVER WATERSHED: LEVELS OF CONTAMINATION IN THREE FLOOD CONTROL CHANNELS AND SAN DIMAS CANYON CREEK**

Victor M. Delgado and S. V. Merritt, Biology Dept., University of La Verne, La Verne, CA 91750

- 59 P **ASSESSING THE POTENTIAL FOR PALEOCLIMATE STUDIES IN CRYSTAL LAKE, SOUTHERN CALIFORNIA.**
M.B. DeRose and M.E. Kirby. California State University, Fullerton, Department of Geological Sciences, Fullerton, CA 92834.
- 60 E **SEASONAL BACTERIAL CONCENTRATIONS IN THE LONG BEACH/LOS ANGELES HARBOR COMPLEX**
K. E. Flaherty, C. V. Wolfe, K. A. Snow, K. Kull, and R. E. Pieper, Southern California Marine Institute, Terminal Island, CA, 90371.
- 61 M **ISOLATION AND CHARACTERIZATION OF MICROSATELLITE LOCI OF YELLOWFIN GOBY, *ACANTHOGOBIUS FLAVIMANUS***
E.M. Gallardo and R.R. Wilson, Jr., California State University, Long Beach, Department of Biological Sciences, Long Beach, CA 90840
- 62 E **EFFECTS OF LIGHT AND TEMPERATURE ON PHOTOSYNTHETIC RESPONSES OF THE INVASIVE INTERTIDAL SEAWEED *CAULACANTHUS USTULATUS* (RHODOPHYTA)**
V. G. Galvan and S. N. Murray. Department of Biological Science, California State University, Fullerton, Fullerton, CA, 92834-6850.
- 63 **THE STATE OF SAN DIEGO BAY IN 1998: ECOLOGICAL CONDITIONS**
A.K. Groce, D. Pasko, D.A. Ituarte, E.C. Nestler, R.J. Gartman, T.D. Stebbins, R.N. Haring. City of San Diego Ocean Monitoring Program, San Diego, CA, 92101.
- 64 E **LOSS OF *accD* GENE FROM CHLOROPLAST GENOMES**
M.E. Harris, G. Meyer, V.M. Vandergon, and T. Vandergon. California State University, Northridge, Department of Biology, Northridge, CA, 91330.
- 65 M **THE EFFECTS OF EXCESS ZINC ON DEVELOPING MURINE THYMOCYTES.**
Thomas H. Hatch and Christine Broussard. University of La Verne, Department of Biology, La Verne, CA, 91750.
- 66 **SCRIPPS INSTITUTION OF OCEANOGRAPHY BENTHIC INVERTEBRATES COLLECTION.**
L. L. Lovell, Senior Collection Manager, Scripps Institution of Oceanography, 9500 Gilman Drive La Jolla, CA 92093-0244
- 67 **CLONING OF YEAST ENV GENES RESPONSIBLE FOR LYSOSOMAL PROTEIN TRAFFICKING AT A POST-GOLGI, PRE-VACUOLAR COMPARTMENT**
¹ C. Frost, ² M. Garcia, ² C. Funiciello, ² L. McLennan, ² E. Gharakhanian; ¹ Department of Chemistry and Biochemistry, ² Department of Biological Sciences, California State University, Long Beach, Long Beach, CA 90840
- 68 **SEDIMENT CONDITIONS WITHIN SAN DIEGO BAY – RESULTS OF BIGHT'98 REGIONAL SURVEY.**

Dean Pasko, Daniel A. Ituarte, Eric C. Nestler, Ami K. Groce, Timothy D. Stebbins, R. Nicholas Haring. City of San Diego Ocean Monitoring Program, San Diego, CA 92101.

- 69 E** **STRUCTURE OF THE BENTHIC MACROFAUNA IN BAHÍA SANTA ROSALITA, BAJA CALIFORNIA, MÉXICO.**
V. Rodríguez-Villanueva¹, R. Martínez-Lara², and M. Mondragón-Rojas³. ¹Facultad de Ciencias Marinas. Instituto de Investigaciones Oceanológicas (I.I.O). Universidad Autónoma de Baja California (UABC). Km 107 Carretera Tijuana-Ensenada. Ensenada, B.C. México. Apdo. Postal 453; ²Marine Biology Laboratory, City of San Diego Ocean Operations, 2392 Kincaid Rd, San Diego, California 92101-0811. USA; ³CISESE . Km 107 Carretera Tijuana-Ensenada. Ensenada, B.C. México. Apdo. Postal 2732.
- 70 E** **MALE MORPHOLOGY AND CALLING SONG CHARACTERISTICS IN THE FIELD CRICKET, GRYLLUS BIMACULATUS**
R Sison, N. R. Moradian, E. Cole and S. E. Walker, Department of Biological Science, California State University, Fullerton, Fullerton, CA 92834-6850
- 71 E** **MOLECULAR EVOLUTION OF THE CHALCONE SYNTHASE GENE FAMILY IN *DUBAUTIA LINAERIS* (HAWAIIAN SILVERSWORD)**
S. J. Smith and V.O. Vandergon, California State University, Northridge, Department of Biology, Northridge, CA 91330
- 72 E** **PHYLOGEOGRAPHY OF *NORRISIA NORRISI* IN THE SOUTHERN CALIFORNIA BIGHT, WITH AN EMPHASIS ON GENETIC VARIATION BETWEEN DISTURBED AND UNDISTURBED HABITATS.**
Michelle Stabio, California State University, Los Angeles
- 73 M** **MOLECULAR ANALYSIS OF GENETIC VARIATION IN THE FEDERALLY ENDANGERED *ASTRAGALUS JAEGERIANUS* (FABACEAE, PAPILIONOIDEAE): A SPECIES WITH A RESTRICTED GEOGRAPHIC RANGE**
G.F. Walker and A.E. Metcalf, California State University, San Bernardino, Biology Department, San Bernardino, CA 92407.
- 74** **THE ROLE OF PLANT-SOIL FEEDBACKS IN COASTAL SAGE SCRUB RESTORATION ON SANTA CRUZ ISLAND, CA.**
Stephanie Yelenik, Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93107.
- 75** **THE EFFECT OF SUBSTRATE SALINITY ON THE GROWTH OF *SALICORNIA VIRGINICA* L.**
Crystal Marquez^{1,2}, Tori Matthys², Christine Der², and Philippa M. Drennan². ¹US Army Corps of Engineers and ²Loyola Marymount University, Biology Department, Los Angeles, CA 90045.

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Union Ballroom A

Session: Molecular Ecology

Chair: Ray Wilson, CSU Long Beach

- 76 9:00 **PHYLOGEOGRAPHY AND PATTERNS OF GENETIC DIFFERENTIATION IN THE WESTERN FENCE LIZARD, *SCELOPORUS OCCIDENTALIS*, IN SOUTHERN CALIFORNIA**
James W. Archie, Department of Biological Sciences, California State University, Long Beach, CA 90840
- 77 E 9:20 **MOLECULAR ECOLOGY OF A RIPARIAN AMPHIBIAN IN SOUTHERN CALIFORNIA: THE CALIFORNIA TREEFROG (*Pseudacris cadaverina*)**
I.C. Phillipsen and A.E. Metcalf. Department of Biology, California State University, 5500 University Parkway, San Bernardino, CA 92407
- 78 9:40 **NUCLEAR GENE FLOW IN AREAS OF PRESUMED SECONDARY CONTACT IN THE WESTERN FENCE LIZARD, *SCELOPORUS OCCIDENTALIS* IN THE SAN GABRIEL MOUNTAINS OF SOUTHERN CALIFORNIA**
T. J. Vail, California State University, Long Beach, Department of Biological Sciences, 1250 Bellflower Blvd., Long Beach, CA 90840
- 79 10:00 **ECOLOGICAL GENETICS OF THE TIDEPOOL COPEPOD *TIGRIOPUS CALIFORNICUS***
S. Edmands, J. Deimler and J.S. Harrison. University of Southern California, Department of Biological Sciences, Los Angeles, CA, 90089.
- 80 E 10:20 **CONTRASTING DISPERSAL IN TWO CALIFORNIA ABALONE SPECIES USING A POPULATION GENETIC APPROACH**
K.M. Gruenthal and R.S. Burton. Marine Biology Research Division, Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA, 92037
- 10:40 **BREAK**
- 11:00 **Plenary Talk: NOAH'S FLOOD: MYTH OR HISTORICAL REALITY**
Dr. Walter C Pitman III, Lamont_ Doherty Earth Observatory, Columbia University
- 12:00 – 1:20 **LUNCH BREAK**

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Union Ballroom A

Session: Molecular Ecology

Chair: Ray Wilson, CSU Long Beach

- 81 1:20 **DIVERSITY, HISTORY, AND PHYLOGEOGRAPHY OF THE NORTHEASTERN PACIFIC COAST**
D. K. Jacobs, **T. A. Haney**, and K. D. Louie. Department of Organismic Biology, Ecology and Evolution, University of California Los Angeles, Los Angeles, CA, 90007
- 82 1:40 **STOCK STRUCTURE ANALYSES OF SPOTTED DOLPHINS IN THE EASTERN TROPICAL PACIFIC OCEAN REVEAL A HIGH DEGREE OF FEMALE PHILOPATRY**
S. Escorza-Treviño^{1,2}, M. Rosales¹, A. Lang², and A.E. Dizon². (1) Department of Biological Sciences, California State University, 5151 State University Dr. Los Angeles, CA 90032. (2) Southwest Fisheries Science Center. 8604 La Jolla Shores Dr. La Jolla, CA 92038
- 83 2:00 **THE EFFECTS OF DISPERSAL AND HABITAT PREFERENCES ON SPECIATION IN CARIBBEAN MARINE OSTRACODES**
E. Torres and D.G. Valdez, Center for Environmental Analysis, Department of Biological Sciences, California State University, Los Angeles, CA, 90032-8201.
- 84 E 2:20 **APPLICATION OF BEAD ARRAY TECHNOLOGY TO COMMUNITY DYNAMICS OF MARINE PHYTOPLANKTON**
C.K. Ellison and R.S. Burton, Marine Biology Research Division, Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA 92037-0208
- 84a F 2:40 **GENETIC DIFFERENTIATION OF THE BIOLUMINESCENT MARINE FISH *PORICHTHYS NOTATATUS* (BATRACHOIDIDAE)**
Elizabeth Torres Department of Biology and Microbiology, California State University Los Angeles, Los Angeles, CA, USA
Imelda L. Nava Department of Organismic Biology, Ecology, and Evolution, University of California Los Angeles, Los Angeles, CA , USA
- 3:00 **BREAK**
- 85 E 3:20 **WHAT MTDNA TELLS US ABOUT THE INAVSION HISTORY OF YELLOWFIN GOBY IN CALIFORNIA-PART I.: THROUGH THE BOTTLE'S NECK?**
M.E. Neilson and R.R. Wilson, Jr. California State University Long Beach, Department of Biological Sciences, Long Beach, CA 90840.

- 86 3:40 **WHAT MTDNA TELLS US ABOUT THE INVASION HISTORY OF YELLOWFIN GOBY IN CALIFORNIA—PART II: HOW MANY INVASIONS?**
M.E. Neilson and R.R. Wilson, Jr., California State University, Long Beach, Department of Biological Sciences, Long Beach, CA 90840
- 87 4:00 **MICROSATELLITE ALLELE FREQUENCY ANALYSIS OF *ACANTHOGOBIUS FLAVIMANUS*: EVIDENCE FOR POSSIBLE GENE FLOW BETWEEN SAN FRANCISCO BAY AND TOKYO BAY.**
A.R. Beck, E.M. Gallardo, J.L. Dickens, M.E. Neilson, and R.R. Wilson Jr. California State University, Long Beach, Department of Biology, Long Beach, CA, 90840.

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Union Ballroom B

Session: Stress Responses in Fish

Chair: Kevin Kelly and Chris Lowe , CSU Long Beach

- 88 9:00 **INTRODUCTION TO THE SYMPOSIUM – ITS PURPOSE AND PLAN.**
K.M. Kelley and C.G. Lowe, Marine Biology Program, Department of Biological Sciences, California State University, Long Beach, Long Beach, CA 90840
- 89 9:20 **THE FISH CASE-STUDY OF THE VERTEBRATE STRESS RESPONSE AND ITS RELEVANCE TO HUMAN-DERIVED IMPACTS IN MARINE FISHES**
K.M. Kelley¹, M.M. Galima¹, J.A. Reyes¹, K. Sak¹, D. Topping¹, K. Goldman², and C.G. Lowe¹. ¹Marine Biology Program, Dept. Biological Sciences, California State University, Long Beach, Long Beach, CA 90840; ²Jackson State Univ., Dept. of Biology, P.O. Box 18540, Jackson, MS 39217.
- 90 9:40 **REGULATION OF STRESS STEROIDS IN MAMMALS AND FISH: COMMON MECHANISMS AND DIFFERENCES.**
M.E. Baker, Department of Medicine - 0693, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093-0693.
- 91 10:00 **CATCH-AND-RELEASE STRESS: IMPACTS ON THE ENDOCRINE PHYSIOLOGY OF THE CALIFORNIA SHEEPHEAD, *SEMICOSSYPHUS PULCHER***
M.M. Galima, C.G. Lowe, and K.M. Kelley. Department of Biological Sciences, California State University Long Beach, Long Beach, CA, 90840.

- 92 F 10:20 PARASITES OF FISHES ASSOCIATED WITH WASTEWATER DISCHARGE AND THE POTENTIAL OF INFESTATION AND STRESS ON HOST FISHES.**
J.E. Kalman. University of California Los Angeles, Department of Organismic Biology, Ecology and Evolution, Los Angeles, CA 90095 and Orange County Sanitation District, Environmental Compliance and Monitoring Division, Fountain Valley, CA 92708.
- 10:40 – 11:00 BREAK**
- 11:00 – 12:00 Plenary Talk: NOAH'S FLOOD: MYTH OR HISTORICAL REALITY**
Dr. Walter C Pitman III, Lamont_ Doherty Earth Observatory, Columbia University
- 12:00 – 1:20 LUNCH BREAK**
- 93 F 1:20 ALTERED ENDOCRINE PHYSIOLOGY OF SOUTHERN CALIFORNIA FLATFISH COLLECTED NEAR WASTEWATER TREATMENT PLANT (WWTP) OUTFLOW - STRESS AND GROWTH.**
J.A.Reyes¹, K. Sak¹, M.M. Galima¹, J.L Armstrong², and K.M. Kelley¹Endocrine Laboratory & Marine Biology Program, Dept. Biological Sciences, California State University, Long Beach, Long Beach, CA 90840; ²Orange County Sanitation District, Fountain Valley, CA, 92708.
- 94 1:40 INTEGRATING PHYSIOLOGICAL AND BEHAVIORAL RESPONSES OF CALIFORNIA SHEEPHEAD EXPOSED TO FISHING-RELATED STRESSORS AND ITS IMPLICATIONS TOWARDS MANAGEMENT.**
C.G. Lowe¹, D.T. Topping¹, M.M. Galima¹, K.J. Goldman², and K.M. Kelley¹.¹Dept. of Biological Sciences, CSU Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, clowe@csulb.edu, 562-985-4918. ²Jackson State Univ., Dept. of Biology, P.O. Box 18540, Jackson, MS 39217.
- 95 2:00 GROWTH AND SURVIVAL IN JUVENILE WHITE SEABASS CAUGHT-AND-RELEASED ON OFFSET CIRCLE AND J-TYPE HOOKS**
S.A. Aalbers¹, G.M. Stutzer² and M.A. Drawbridge¹Hubbs-SeaWorld Research Institute 2595 Ingraham St. San Diego, CA. 92109 ²CSU San Marcos, 333 S. Twin Oaks Valley Rd. San Marcos CA 92096
- 96 2:20 MOLECULAR INDICATORS OF CAPTURE RELATED STRESS IN SHARKS**
D. Bernal and J. Smith. Weber State University, Department of Zoology, Ogden, UT, 84408
- 97 2:40 THE PHYSIOLOGICAL EFFECTS OF CAPTURE STRESS IN TUNAS, BILLFISHES, AND SHARKS WITH INFERENCES ON POST-RELEASE RECOVERY.**
G.B. Skomal. Massachusetts Division of Marine Fisheries, Martha's Vineyard Research Station, P.O. Box 68, Vineyard Haven, MA, 02568.
- 3:00 – 3:20 BREAK**

- 98 3:20 **CATCH AND RELEASE STRESS IMPACTS ON FISH:
INTEGRATING RESEARCH FINDINGS INTO MANAGEMENT
DECISIONS AND ANGLER CATCH AND RELEASE
PRACTICES**
S.F. Theberge. Oregon Sea Grant, Clatsop County Extension Office, OSU
Seafood Laboratory Astoria, OR, 97103
- 3:40 – 4:00 **DISCUSSION – OPEN PANEL I. Additional and/or Future Questions,
Overall Conclusions, Recommendations**
- 4:00 – 4:20 **DISCUSSION – OPEN PANEL II. (Additional time if necessary)**

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Union Ballroom C

Session: Molecular Biology of Cellular Processes

Chair: Editte Gharakhanian

- 99 9:00 **CHARACTERIZATION OF LIGHT HARVESTING
-DEPENDENT, CHLOROPLAST LOCALIZED AtcDPPIV
DIPEPTIDYL AMINOPEPTIDASE IN *ARABIDOPSIS THALIANA***
J. A. Brusslan, S. E. Martini, and H.-I. Lee. Department of Biological Sciences,
California State University, Long Beach, 1250 Bellflower Blvd., Long Beach,
CA 90840-3702.
- 100 M 9:20 **HIGH-LIGHT INDUCIBILITY RETAINED IN A 216 BP
FRAGMENT OF THE *ARABIDOPSIS ELIP1* PROMOTER**
Gorjana Bezmalinovic, Livier Corado, Judy A. Brusslan. California State
University, Long Beach, Department of Biological Sciences, Long Beach, CA,
90840
- 101 9:40 **VESICULAR TRANSPORT TO THE YEAST LYSOSOMAL
VACUOLE**
Editte Gharakhanian, CSULB, Dept. of Biological Sciences
- 103 10:00 **TARGETING OF NEUROLIGIN IN CULTURED HIPPOCAMPAL
NEURONS**
C. R. Rosales¹, K. O. Osborne¹, P. Scheiffele², M. A. Silverman¹ California State
Polytechnic University, Pomona, Department of Biological Sciences, CA,
91768.¹ Columbia University, Center for Neurobiology and Behavior, NY,
10032.²
- 10:40 **BREAK**
- 11:00 **Plenary Talk: NOAH'S FLOOD: MYTH OR HISTORICAL REALITY**
Dr. Walter C Pitman III, Lamont_Doherty Earth
Observatory, Columbia University

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Union Ballroom C

Session: Archaeology of Southern California

Chair: Andrea P. Murray, California State University, Fullerton

- 104 1:20 PRELIMINARY RESULTS FROM ANAVERDE VALLEY**
Sherri M. Gust and Vanessa Mirro, Cogstone Resource Management Inc., Santa Ana, CA 92701
- 105 1:40 PRESERVING ORANGE COUNTY'S ARCHAEOLOGICAL LEGACY**
Andrea P. Murray, Department of Anthropology, California State University, Fullerton, CA 92834
- 106 2:00 THE USE OF FIRED CLAY DAUB FROM CA-ORA-269 IN THE IDENTIFICATION OF PREHISTORIC DWELLING CONSTRUCTION METHODS**
Ivan H. Strudwick, LSA Associates, Inc.
- 107 2:20 ROCK ART AND SOCIAL RITUALS: FEMALE PUBERTY CEREMONIES AND PETROGLYPH MOTIFS AMONG NATIVE CALIFORNIANS**
D. Barter, B. Butler, S. Fulsom, G. Gonzalez, A. Martinez, C. Potts, C. Purtell, and R. Yamashita, Department of Anthropology, California State University Dominguez Hills, 1000 E. Victoria St., Carson, CA 90747
- 108 2:40 THE ARCHAEOLOGY OF REGIONS: AN INITIAL REPORT OF THE WESTERN SANTA MONICA MOUNTAINS-OXNARD PLAIN PROJECT**
C. Delaney-Rivera, California State University-Fullerton, Department of Anthropology, Fullerton, CA 92834
- 3:00 BREAK**
- 109 3:20 LARGE FRACTION FISH MATERIAL FROM SLO-2: FITCH (1972) REVISITED**
J.W. Gaeta and K.W. Gobalet, Department of Biology, California State University, Bakersfield, CA 93311.
- 110 3:40 THE TALEGA SITE AND ENCINITAS TRADITION PREHISTORY IN ORANGE COUNTY**
David D. Ferraro, Viejo California Associates, 22512 Via Loyola, Mission Viejo CA

- 111 4:00 **THE CHIPPED STONE TOOLS OF CA-ORA-840, A MILLINSTONE HORIZON SITE IN SOUTHERN ORANGE COUNTY**
Natalie Lawson, LSA Associates, 1650 Spruce St, Riverside, CA 92507
- 112 4:20 **BOTANICAL TERMS AMONG THE UTO-AZTECAN SPEAKERS OF SOUTHERN CALIFORNIA**
Stephen O'Neil, SWCA Environmental Consultants, 23392 Madero, Mission Viejo, California, 92691.
- 113 4:40 **FISHING AND MARINE MAMMAL HUNTING PATTERNS FROM A 2500-YEAR OLD CAMPSITE ON SAN NICOLAS ISLAND**
S.R. James, Department of Anthropology, California State University at Fullerton, P.O. Box 6846, Fullerton, CA 92834-6846.

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Alamitos Room

Session: Contributed Papers

Chair: John Roberts, CSU Dominguez Hills.

- 114 E 9:00 **THE ROLE OF MACROPHYTES IN THE DIETS OF THE SUSPENSION-FEEDING MUSSEL *MYTILUS CALIFORNIANUS* ON SOUTHERN CALIFORNIA SHORES: A CARBON ($\delta^{13}\text{C}$) AND NITROGEN ($\delta^{15}\text{N}$) STABLE ISOTOPE ANALYSIS**
L. Gilbane and S. N. Murray, Department of Biological Science, California State University, Fullerton, California, 92834-6850
- 115 F 9:20 **AGE AND GROWTH OF THE ROUND STINGRAY, *UROBATUS HALLERI*, AT SEAL BEACH, CALIFORNIA**
Lori Hale, California State University Long Beach, Department of Biological Sciences, CA 90840, lhale@csulb.edu
- 116 E 9:40 **ASPECTS OF THE LIFE HISTORY OF THE BLACK CROAKER (*CHEILOSTREMA SATURNUM*) FROM WITHIN THE SOUTHERN CALIFORNIA BIGHT.**
Miller, Eric F., California State University, Northridge, Northridge, CA.
- 118 F 10:00 **GENE FLOW AMONG SPOTTED SAND BASS, *PARALABRAX MACULATOFASCIATUS*, POPULATIONS WITHIN THE SOUTHERN CALIFORNIA BIGHT**
M. P. Salomon, Department of Biology, California State University Northridge, Northridge, CA, 91330.
- 117 10:20 **MICROHABITAT COLOR PREFERENCES OF FOUR *TEGULA* SPECIES IN DANA POINT, CALIFORNIA**
G.K. Nishiyama and C.A. Kay-Nishiyama. College of the Canyons, Santa Clarita, California 91355

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Science Lecture Hall 48

Session: Research Training Program: Session I

Chair: Richard Schwartz,

- 119 8:40 **The *CYP1B1* L432V Polymorphism and Risk of Colorectal Cancer**
Gloria Chi, Alhambra High School
- 120 9:00 **THE EFFECTS OF DYNEIN AND KINESIN ON THE
INTRACELLULAR MOVEMENTS IN THE PARIETAL CELLS**
J. Gov and C.T. Okamoto. Department of Pharmaceutical Sciences, School of
Pharmacy, University of Southern California, Los Angeles, California 90089-
9121
- 121 9:20 **ANALYSIS OF FERRITIN EXPRESSION IN VARIOUS CELL
LINES WITH FLOW CYTOMETRY**
Serena Ann Lee. University of Southern California Keck School of Medicine,
Department of Pathology, Los Angeles, CA, 90089.
- 122 9:40 **IDENTIFYING NEURAL REGIONS RESPONSIBLE FOR LIFESPAN IN
DROSOPHILA**
Maham Ahmad, 501 N Chapel #1, Alhambra CA. Alhambra High School,
Alhambra, CA-91801 Mentor/Teacher: David Walker [Benzer Lab, Caltech]
Duane Nichols [Alhambra High School].
- 123 10:00 **THE EFFECTS OF PROGESTIN ON THE HORMONE RECEPTOR
CONTENT OF HUMAN ENDOMETRIAL EXPLANTS.**
Dorothy Chan, Alhambra High School, *Mentor*: Dr. Juan C. Felix
- 124 10:20 **INHIBITING THE GROWTH OF AN EWING SARCOMA TUMOR
CELL LINE USING SIRNAS DELIVERED AS COMPLEXES TO CDPS
THAT TARGET THE EWS/FLI-1 ONCOGENIC FUSION GENE.**
S.B. Ha and J. D. Heidel. Mark E. Davis Research Group, California
Institute of Technology, Department of Chemical Engineering, Pasadena, CA,
91125.

10:40 BREAK

11:00 Plenary Talk: NOAH'S FLOOD: MYTH OR HISTORICAL REALITY
Dr. Walter C Pitman III, Lamont_ Doherty Earth
Observatory, Columbia University

12:00 – 1:20 LUNCH BREAK

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Science Lecture Hall 48

Session: Research Training Program: Session I

Chair: Martha Schwartz,

- 125 1:20 **PROGESTERONE RECEPTOR EXPRESSION AND LOCALIZATION IN ADULT MONKEY TESTES.**
Brittany Hahn, Yan-He Lue, M.D., Christina Wang, M.D., Ronald Swerdloff, M.D., Palos Verdes Peninsula High School and Div. of Endocrinology, Dept. of Medicine, Harbor-UCLA Medical Center Research and Education Institute, Torrance, California.
- 126 1:40 **THE DISTRIBUTION AND BINDING PARTNERS OF KINESIN II IN RABBIT LACRIMAL ACINI**
J. Hu, USC Medical Center, School of Pharmacy, Department of Cell Biology, Los Angeles, CA, 90033
- 127 2:00 **SUSCEPTIBILITY OF OXIDATIVELY CROSSLINKED AMYLOID BETA-PROTEIN TO INSULIN-DEGRADING ENZYME**
J. Young. Alhambra High School, USC School of Pharmacy, Department of Pharmaceutical Sciences, Los Angeles, CA, 90089-9121.
- 128 2:20 **DETECTING SNPs IN EXON 1 OF THE *HOXA10* GENE OF CRYPTORCHID PATIENTS**
C. Tat, D. Ren, A.T. Diep, and V. Cortessis. USC Haile's Lab, USC/Norris Cancer, Department of Genetics/Epidemiology, Los Angeles, 90033.
- 129 2:40 **PHAGOCYTOSIS AND CYTOTOXICITY OF NICKEL OXIDE**
Janey Yu University of Southern California, USC/Norris Comprehensive Cancer Center Keck School of Medicine, Cancer Research Laboratory, 1301 North Mission Road, Room #218, Los Angeles, CA 90031
- 3:00 **BREAK**
- 130 3:20 **HIPPOCAMPAL EXPRESSION OF BDNF 5' EXONS IN AGED FISHER RATS**
Robin Zhou, Alhambra High School, Alhambra, California
Mentor: Dr. Amelia Russo-Neustadt
- 131 3:40 **EFFECTS OF PHOSPHATE ON THE BIOLOGICAL PROCESSES OF TRICHODESMIUM**
S.F. Ong¹, J. Sohm², and D. Capone². ¹California Academy of Mathematics and Science, Carson, CA. ²Wrigley Institute of Environmental Biology, University of Southern California, Department of Biological Sciences, Los Angeles, CA.

- 131a 4:00 **GENE MUTATION IN DYDKERATOSIS CONGENITA- STUDY OF EXON 8.**
Samir Mehrotra, Viewpoint School, Calabasas, CA 91302, Marisa Briones, Pavel Lieb, Dr. Aida Metzzenberg, California State University at Northridge, Northridge, CA 91330
- 4:30 **Presentation by students who went to National AAJAS Meeting and student Intel Science Contentants; Joon-Bok (James) Lee, Su Fey Ong, Ved Chirayeth, Eddie Smetak and Genevieve Williams. Meeting will occur in Alamitos Room, Student Union**

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Science Lecture Hall 50

Session: Research Training Program: Session II

Chair: Kathy Phalen,

- 132 8:40 **PHOTOMETRIC DETECTION OF AN EXTRA-SOLAR PLANETARY TRANSIT ACROSS HD 209458 PHASE II – VOLUMETRIC ANALYSIS AND EXTRAPOLATION FOR SYSTEM– TECHNIQUES FOR INDIRECT DETERMINATION OF PROTOPLANETARY DISKS**
Ved Chirayath¹ - ¹Southern California Academy of Sciences & The California Academy of Math and Science, 1000 E. Victoria St. #8002, Dominguez Hills, CA 90747
- 133 9:00 **THE CHEMICALLY DEFINABLE DIFFERENCES BETWEEN WATER WASH AND NON-WATER WASH SYSTEM IN ANALYSIS OF WATER CONTENT.**
L. Huang, A. Chu, and C. Tan, II. The Bio-Diesel Team, Gabrielino High School, Department of Technology, San Gabriel, CA, 91776.
- 134 9:20 **ALGORITHM PERFORMANCE ON THE SATISFIABILITY PROBLEM**
Timothy L. Uy and Dennis Kibler, University of California: Irvine, Department of Computer Science, Irvine, California 92697-3425
- 135 9:40 **DESIGN AND CREATION OF A LOW-COST VOLUMETRIC DISPLAY DEVELOPMENT SYSTEM.**
Michael McDaniels, California Academy of Math and Science
- 136 10:00 **MICROBIAL RESPONSE TO EXPOSURE FROM VARIOUS STRESSORS**
Sanyl Kabre, 4508 W 133rd St. Hawthorne, CA, 90250.
-

137 10:20 STRAIN RELATEDNESS OF *CANDIDA* IN HUMANS: A URINARY PATHOGEN OR COLONIZER?
Joon-Bok Lee, Division of Infectious Diseases, Los Angeles County Harbor-UCLA Medical Center, 1000 W. Carson Street, Torrance, California 90502

10:40 BREAK

11:00 Plenary Talk: NOAH'S FLOOD: MYTH OR HISTORICAL REALITY
Dr. Walter C Pitman III, Lamont_Doherty Earth Observatory, Columbia University

12:00 – 1:20 LUNCH BREAK

Southern California Academy of Sciences 2004 Session Schedule

Saturday, May 15, 2004

Location: Science Lecture Hall 50

Session: Research Training Program: Session II

Chair: John Dorsey

138 1:20 DETERMINATION OF BACTERIAL AND POLLUTANT FLOWS IN COASTAL ESTUARIES OF SOUTHERN CALIFORNIA
S. Yanamadala and J. Dorsey. Loyola Marymount University, Department of Natural Sciences, Los Angeles, CA, 90045.

139 1:40 ENVIRONMENTAL INFLUENCE ON THE CLONING RATES OF METRIDIDIUM SEA ANEMONES
Kevin McCully, 28320 Coveridge Dr., Rancho Palos Verdes, CA, 90275

140 2:00 MODELING THE DISTRIBUTION OF INVASIVE ARGENTINE ANTS IN THE CONTIGUOUS UNITED STATES: EFFECTS OF CLIMATIC FACTORS AND HUMAN HABITATION
G. Y. Williams. Redondo Union High School, Redondo Beach, CA 90277.

141 2:20 THE EFFECT OF BODY SYMMETRY ON ATHLETIC ABILITY
Nicole Young Palos Verdes Peninsula High School

142 2:40 MOTOR DEVELOPMENT IN CHICKEN EMBRYOS
Joanne Siu, Alhambra High School, Mentor: Nina Bradley, USC Keck School of Medicine

3:00 BREAK

143 3:20 QUANTUM YIELD STUDIES OF SINGLET OXYGEN PRODUCTION BY SQUARE PLANAR COMPLEXES
H. Fong, J. Tang, A. Tran, and M. Selke. California State University, Los Angeles Department of Chemistry and Biochemistry, 5151 State University Drive, Los Angeles, CA 90032

- 144 3:40 **ACCESSING THE EFFECTS OF SLEEP DEPRIVATION IN A LONG LIVED *DROSOPHILA MELANOGASTER* LINE**
Anum Sheikh: California Institute of Technology, Benzer Lab, Department of Biology Pasadena, CA
- 145 4:00 **ACTIVITIES CHARACTERISTIC OF *DROSOPHILA* LONGEVITY MUTANTS 1101, 1130, AND 2456**
Anna Lam, Alhambra High School, Mentor: Dr. Horng-Dar Wang, California Institute of Technology
- 4:30 **Presentation by students who went to National AAJAS Meeting and student Intel Science Contentants; Joon-Bok (James) Lee, Su Fey Ong, Ved Chirayeth, Eddie Smetak and Genevieve Williams. Meeting will occur in Alamitos Room, Student Union**

ABSTRACTS

1. DON REISH'S ANNUAL MARINE POLLUTION LITERATURE REVIEW: FOUR DECADES OF MONITORING THE SCIENCE

A.J. Mearns, Hazardous Materials Response Division, National Oceanic and Atmospheric Administration, Seattle, WA 98115 and P. N. Oshida, U.S. Environmental Protection Agency, Washington, D.C.

For over three decades Donald Reish has been senior author of an annual review of the marine pollution literature, published in *Water Environment Research Journal*. The focus of the annual review is on the effects of pollution on marine life. Co-authors include past graduate students and a variety of other colleagues. Each year Don identifies up to 300 papers, sorts them by major subjects (oil pollution, sewage effects, monitoring, tissue residues, toxicity testing, marine debris, book and conference reviews, etc), assigns co-authors to read and summarize the papers, and then collates the results into a story of each year's marine pollution literature. Several of us have been "on board" as co-authors for nearly 30 years, always eagerly awaiting our "winter holiday" package of 3 x 5 cards. Thousands of papers have been reviewed by this team, providing Don, co-authors, and readers with a broad overview of trends in marine pollution topics, issues and research and how it has changed over the years. When Don started the review, the effects of marine pollution were obvious to anyone who went into the field, the LC50 was the standard bioassay and most of the papers were from the US, Canada and western Europe. Today, authors from Asia, the Mediterranean, Eastern Europe, South America and Africa vie with North Americans and Brits in paper production. Molecular biology has taken a controversial but commanding role. The history of the effects of marine pollution may be well served by this entire collection.

2. VARIABILITY IN POLYCHAETES: REGENERATING RUBBER-BANDS?

K. Fauchald, Smithsonian Institution, National Museum of Natural History, Department of Zoology, MRC 0163 Washington DC, 20013-7012,

Despite the widely shared opinion about variability, especially of size-related features, in polychaetes, a preliminary study of both long- and short-bodied species suggest strong limitations on intra-specific variability. Examples from eunicid and polynoid polychaetes show that species with a limited number of segments have defined distribution of most major features. Even species with relatively high, and more variable number of segments, show distinct size-dependent patterns in distribution of segmentally occurring features. Invoking regeneration to account for variability should be done only when there is independent evidence of regeneration, such as narrowed anterior or posterior ends.

3. RAPID RECOLONIZATION OF INFAUNAL BENTHOS AT A DEEP-SEA DISPOSAL SITE.

James A. Blake, ENSR Marine & Coastal Center, 89 Water Street, Woods Hole, MA 02543.

A deep ocean dredged-material disposal site (2700-3000 m) off San Francisco was designated in 1994. A benthic monitoring program was initiated in 1995. Until 2002, the benthic infaunal samples were archived, with only sediment profile images and chemistry samples analyzed. Analysis of all archived benthic samples is now underway. Results from 2002 demonstrate that despite seven years of dredged material disposal, the benthic infauna is rich and clearly zoned in

the same manner established during baseline surveys (1990-1991). Fifteen samples from September 2002 yielded a total of 405 species, comparable to 458 species from 28 samples collected during the baseline period. Fifty species collected in 2002 were not recorded in 1990-1991. Approximately 67% of the species are new to science. Lower slope sites (2850-3136 m) were dominated by long, thin-bodied polychaetes such as *Prionospio delta*, *Levinsenia flava*, and *Cossura* spp. Stations from about 2450 to 2775 m included more robust polychaetes such as *Aricidea simplex* and *Chaetozone* sp.1. Density, species richness, and diversity were high and consistent with baseline conditions. Preliminary results from analysis of 1998 samples following periods of heavy dredged material disposal indicate that the fauna was heavily impacted. However, the fauna appears to rapidly recolonize target areas when disposal volumes are reduced. Stations on the boundary of the disposal site in 2002 exhibited a rich and diverse fauna, similar to reference sites.

4. SOFT-BOTTOM MEGABENTHIC INVERTEBRATE POPULATIONS AND ASSEMBLAGES OF THE SOUTHERN CALIFORNIA SHELF IN 1998

M. James Allen¹, Doug Diener², Erica T. Jarvis¹, Valerie Raco-Rands¹, Christina Thomas³, Yvette Ralph³, and Don Cadien.⁴ ¹Southern California Coastal Water Research Project, Westminster, CA 92683; ²MEC Analytical Systems, Inc., Carlsbad, CA 92008; ³Orange County Sanitation District, Fountain Valley, CA 92728; ⁴County Sanitation Districts of Los Angeles County, Whittier, CA 90601

Megabenthic (trawl-caught) soft-bottom invertebrate populations have been monitored locally in southern California for more than 30 years, but the populations and communities have not been described synoptically. This study describes the distribution and relative importance of dominant invertebrate species in regional synoptic survey of the southern California mainland shelf conducted in 1998. Invertebrates were collected by 7.6-m head rope semiballoon otter trawls from 314 stations in 1998 at depths of 5-200 m. Samples were collected on the shelf from 5-200 m from Point Conception, California, to the United States-Mexico International Border (including bays/harbors and islands). Species were identified, counted, and weighed. A total of 313 species of megabenthic invertebrates representing 132 families, 21 classes, and 9 phyla were collected in the survey. Mollusks, arthropods, and echinoderms were the most diverse phyla. White sea urchin (*Lytechinus pictus*), ridgeback rock shrimp (*Sicyonia ingentis*), and California sea cucumber (*Parastichopus californicus*) were among the most important species in occurrence, abundance, and biomass. Invertebrate abundance, biomass, and species richness is much lower on the coastal inner shelf (10-30 m) than in bays or in deeper shelf zones. Invertebrate assemblages were associated with bays/harbors, inner shelf, middle shelf (30-120 m), or outer shelf (120-200 m). Overall, invertebrate populations decreased in mean abundance, biomass, species richness, and diversity relative to 1994, and earlier. Although the distribution of important species generally remained the same between this survey and a previous survey in 1994, some species changed dramatically in importance, perhaps in response to the 1997-1998 El Niño.

6. ASSESSMENT OF COPPER EMISSIONS FROM RECREATIONAL VESSEL ANTIFOULING PAINTS IN SOUTHERN CALIFORNIA

Kenneth Schiff, Dario Diehl, Southern California Coastal Water Research Project, Westminster, CA 92683 Aldis Valkirs, Computer Sciences Corp., San Diego, CA 92110

Trace metals, especially copper, are commonly occurring contaminants in harbors and marinas. One source of copper to these environs is copper-based antifouling coatings used on vessel hulls. The objective of this study was to measure dissolved copper contributions from recreational vessel antifouling coatings for both passive leaching and hull cleaning activities. To accomplish this goal, three coating formulations, including hard vinyl, modified epoxy and a biocide free bottom paint were applied on fiberglass panels and placed in a harbor environment. *In situ* measurements of passive leaching were made using a recirculating dome system. Monthly average flux rates of dissolved copper for the hard vinyl and modified epoxy coatings were 3.7 and 4.3 $\mu\text{g}/\text{cm}^2/\text{day}$, respectively, while flux rates for the biocide free coating was 0.2 $\mu\text{g}/\text{cm}^2/\text{day}$. The highest passive flux rates were measured initially after cleaning activities, rapidly decreasing to a baseline rate within 3 days, regardless of copper-based coating formulation. Hull cleaning activities generated between 8.6 and 3.8 μg dissolved copper/ cm^2/event for the modified epoxy and hard vinyl coatings, respectively. Aggressive cleaning using an abrasive product doubled the copper emissions from the modified epoxy coating, but produced virtually no change in the much tougher hard vinyl coating. When compared on a mass basis, roughly 95% of copper is emitted during passive leaching compared to hull cleaning activities over a monthly time period for a typical 9.1 m power boat.

7. DISCUSSION OF MALDANID NEPHRIDIA, AND AN EMENDED DESCRIPTION OF THE GENUS *PETALOCLYMENE* (ANNELIDA: POLYCHAETA)

K.D. Green, MEC Analytical Systems, Inc.–Weston Solutions, Inc., 2433 Impala Drive, Carlsbad, CA 92008.

Paired nephridiopores occur on the dorsum, posterior to the notopodial setal fascicles in *Petaloclymene pacifica* (Green 1997). This dorsal orientation of nephridiopores has not been previously described for the family Maldanidae. The generic definition of *Petaloclymene* Augener 1918, and the description of *P. pacifica* are emended. Characteristics of nephridia are reviewed relative to their contribution towards the understanding of taxonomic relationships among maldanids.

8. BENTHIC POLYCHAETE COMMUNITIES AT THE MOUTH OF THE SAN FRANCISCO BAY

Dorothy Norris and Michael G. Kellogg; City and County of San Francisco, Public Utilities Commission.

The City and County of San Francisco conducts regional environmental monitoring in the near shore waters of the Gulf of the Farallones (the region on the continental shelf extending about 40 kilometers west of the Golden Gate and bordered on the north and south by Point Reyes and Point San Pedro, respectively) to assess potential impacts on the receiving water environment from the presence of an ocean wastewater discharge. Samples are taken to characterize the physical and chemical properties of the sediments and to evaluate benthic infauna communities in the study area. Offshore monitoring is conducted annually in the fall when sediments are least disturbed and infaunal recruitment is highest.

Results of this monitoring program have demonstrated that benthic infauna communities in the study area are numerically dominated by polychaete species. Five years of data have allowed

recognition of three main infauna communities correlated with sediment grain size. A coarse-grain community was dominated by the polychaetes *Hesionura coineai difficilis* (Banse 1963) and *Heteropodarke heteromorpha* Hartmann-Schröder 1962. The sand bars surrounding the mouth of San Francisco Bay, with predominantly well-sorted fine sands, were numerically dominated by the polychaete *Spiophanes bombyx* (Claparède 1870) and also characterized by a higher proportion of crustaceans than the other infauna communities. A third community existed in areas beyond the sand bars where the sediments were predominantly very fine sands with a variable percentage of silt and clay. This latter community was numerically dominated by the polychaete *Spiophanes berkeleyorum* Pettibone 1962, and the bivalve *Tellina modesta* (Carpenter 1864) and was the most diverse of the communities in the study area. Five years of data analysis indicate consistently higher concentrations of organic and inorganic contaminants, and increased benthic infauna abundance in those areas with higher percentages of silt and clay. An examination of long-term trends in the benthic infauna data found that seasonality and oceanographic influences were major factors affecting the benthic community structure in the study area.

This paper will present the polychaete community components and their relationship to the sedimentary environment using both ordination and cluster analyses.

9. USE OF REGIONAL DATA TO EVALUATE AND DEVELOP SEDIMENT QUALITY GUIDELINES

S.M. Bav¹, D.E. Vidal¹, and P.L. Myre². ¹Southern California Coastal Water Research Project, Westminster, CA, 92683; ²Exa Data and Mapping Services, Port Townsend, WA, 98368

Many types of sediment quality guidelines (SQGs) are available for the interpretation of sediment chemistry. However, information describing the accuracy of the different SQGs for predicting sediment toxicity or benthic community degradation is limited, often resulting in controversy regarding which guideline is appropriate for use. One factor further complicating the decision is that site-specific or regional differences in habitat or contamination characteristics may affect the performance of SQGs, thus creating uncertainty regarding their suitability. The availability of synoptic sediment quality data from regional monitoring and other assessment programs provides the opportunity to evaluate SQG performance on a regional level and identify the best SQGs for specific applications. A dataset consisting of matched coastal southern California sediment chemistry and acute amphipod toxicity measurements for 1100 samples was developed using EMAP and other regional monitoring data, as well as dredge material characterization information. This dataset was used to evaluate the performance of six SQG approaches, including the effects range-median (ERM), consensus median effect concentration (MEC), equilibrium partitioning for organics (EqP), apparent effects threshold (AET), and logistic regression model (LRM). Empirical approaches such as the ERM showed better performance than the EqP and AET. Comparisons with the NOAA Sedtox database indicated that regional differences in the southern California data influenced the performance of the SQGs. The southern California dataset was also used to identify optimized application thresholds for the SQGs and to develop regional guidelines that had improved performance.

10. DEVELOPING A WATER EFFECTS RATIO FOR AMMONIA IN FRESHWATERS OF LOS ANGELES

Jack Q. Word¹, David W. Moore¹, Ashli Cooper², and Mary Ann Irwin¹. ¹MEC Analytical Systems, Inc.; ²Larry Walker Associates

California state and federal water quality criteria have been set for ammonia, although the range of effects appear to vary under different water quality conditions such as water hardness, ionic strength (conductivity), total dissolved solids (TDS), and pH (Borgmann and Borgmann 1997; Ankley et al. 1995). Development of a water effects ratio (WER) is being used to generate data on bioavailability of ammonia relevant to the watercourses of Los Angeles County. A site specific objective (SSO) using a WER can then be used to qualify existing criteria to identify a threshold effect level which has been scientifically tested and validated for the specific waterbody of concern. Our laboratory studies investigated acute and chronic effects of ammonia exposure to the amphipod, *Hyalella azteca* to assist development of a WER for ammonia for two waterbodies of Los Angeles County (the Los Angeles and San Gabriel Rivers). A comprehensive series of toxicological testing was conducted during 4, 7, 14, 28, and 42-d tests with exposure concentrations ranging from < 1 to more than 250 mg/L total ammonia. Associated water quality parameters such as water hardness, TDS, alkalinity, sodium (Na⁺), potassium (K⁺), and total organic carbon (TOC) were carefully monitored and assessed as contributing factors. Results from the acute toxicity testing demonstrated a reduction in toxicity for ammonia-spiked river waters relative to the moderately hard laboratory water (MHLW) by a factor of >2; ammonia toxicity was also reduced by a factor of approximately 2-fold when both EC₅₀ and EC₂₀ responses were compared. Results from chronic testing indicated that spiked ammonia concentrations <25 mg/L in SGR water did not cause adverse effects on the survival, growth, and reproduction of *H. azteca* over a 42-d exposure. Hormesis, or improved survival and growth at low concentrations of ammonia, was observed in all exposure tests that utilized SGR water during chronic testing. Survival was greater at concentration >1 mg/L total ammonia with no influence on survival apparent at concentrations approaching 25 mg/L total ammonia. A preliminary WER was calculated from data generated from the acute bioassay series ranged from 2.5 to 4.9 for the EC50 determinations. Chronic testing indicated the WER threshold was above our highest test concentration, 25 mg/L.

11. LIFE HISTORY CHARACTERISTICS OF *TEREDO NAVALIS* AND *TEREDO BARTSCHI* IN THE VICINITY OF A WARM WATER DISCHARGE: A CASE FOR MONITORING GLOBAL WARMING THROUGH CHANGES IN GEOGRAPHICAL RANGES OF MARINE SPECIES.

D.E. Morgan, Millstone Environmental Laboratory, Dominion Nuclear Connecticut, Inc., Waterford Connecticut 06385, USA

Distribution and life history data were collected from 1968 to 1995 for two species of marine woodboring mollusks in Connecticut coastal waters. *Teredo navalis* is a cosmopolitan, temperate shipworm native to Long Island Sound (LIS), while *Teredo bartschi* is a semi-tropical shipworm and is confined to sites affected by the undiluted discharge of the Millstone Nuclear Power Station (MNPS). *Teredo navalis* grows faster and releases nearly 100 times more veligers than *T. bartschi*. Temperature increases of 3-4 °C and 10-12 °C increased growth about 1.3-1.4 and 1.8-2.1 times, respectively, when compared to ambient conditions. *Teredo navalis* and *T. bartschi* ceased releasing veligers as temperatures dropped below 16 °C, although *T. bartschi*, in contrast to *T. navalis*, does not shutdown brooding activity at winter water temperatures. *Teredo navalis*

ceased releasing veligers above 27 °C, in contrast to *T. bartschi*, which continued to release veligers at the highest discharge temperatures (33 °C). It appears that *T. bartschi* requires higher water temperatures (~22 °C) than are common to the deeper areas of LIS to complete its life history and is not able to survive winter water temperatures common in the shallower waters of LIS (<2 °C). Analysis of long-term trends (28-yr.) in seawater temperature for LIS waters indicates a 1.2-1.5 °C increase. If this warming trend continues, *T. bartschi* should eventually extend its range to LIS.

12. THE ANTHOZOAN FAUNA OF OIL PLATFORMS NEAR POINT CONCEPTION, CALIFORNIA

John C. Ljubenkov. Dancing Coyote Ranch, P.O. Box 781, Pauma Valley, CA 92061

Six oil production platforms in the Santa Barbara Channel and north of Pt. Conception were surveyed using ROV collected photographs and diver collected biological scrapings. Two legs of each platform were photographed from the bottom (ranging between 400 ft and 800 ft) to the intertidal zone and on two platforms (Harvest and Gail) scrapings were collected to about 75 ft. The assemblages were dominated by filter feeders that attach to hard substrate and all platforms had dense mussel beds. Anthozoans were a major group present in nearly every sample. *Metridium senile* was the most encountered anemone at all depths, but *M. farcimen* and *M. exilis* were also present. Other Anthozoan genera that occurred were *Anthopleura*, *?Diadumene*, *Corynactis*, *Amphianthus*, *Balanophyllia*, *Coenocyathus*, *Desmophyllum*, *Paracyathus*, and unidentifiable zoanthids. No strong pattern of zones was apparent. Gorgonians were lacking compared to sewage outfall pipes at similar depths. This paper is part of a study that was funded by Minerals Management Service, Department of the Interior.

13. DEVELOPMENT OF AN EPIBENTHIC COMMUNITY (ANNELIDA: POLYCHAETA) IN AN ARTIFICIAL SUBSTRATUM AT VERACRUZ REEF SYSTEM, GULF OF MEXICO – AN EXPERIMENTAL APPROACH.

V. Díaz-Castañeda (1) & de León-González, J.A. (2) Departamento de Ecología, CICESE, Km 107, Highway Tijuana-Ensenada, Apdo. Postal 2732, Ensenada, B.C., México
vidiaz@cicese.mx (2) Facultad de C. Biológicas, Universidad Autónoma de Nuevo León, Ap. Postal 5" F", San Nicolás de los Garza, Nuevo León, CP66451 México

Coral reefs are among the most complex and diverse biological communities. By providing substrata for sedentary organisms and food or shelter for mobile organisms, living corals create a rich series of habitats for a great diversity of species. This work contributes to the knowledge of the polychaete fauna in Veracruz Reef System. An experiment was designed to assess polychaete colonization patterns in three reefs subjected to different anthropogenic effects: Hornos, Pájaros and Blanca. Macrofauna colonization was studied analyzing 76 terracota plates; three sets of plates were immersed in spring 2001 and monitored for periods varying between 12 and 16 months. A total of 6,491 polychaetes were collected, belonging to 25 families and 127 species. Best represented families were Syllidae, Eunicidae, Nereididae, Cirratulidae, Terebellidae, Serpulidae and Sabellidae. Results confirm the importance and colonizing success of polychaetes, particularly syllids, serpulids and eunicids, in reef environments. Diversity (Shannon Index) varied between 0.80 and 3.70 and equitability (Pielou) between 0.40 and 0.97.

14. FECAL INDICATOR BACTERIA IN TIDAL WATERS OF THE BALLONA WETLANDS.

John H. Dorsey. Loyola Marymount University, Department of Natural Science, North Hall, Los Angeles, CA, 90045.

Densities of fecal indicator bacteria total Coliforms, *E. coli*, Enterococci) were measured within tidal channels of the Ballona Wetlands (Los Angeles County) to see if the wetlands act as a sink or source for these bacteria. Samples were collected on 10 days over a 1-yr period beginning February 2003 at four sites within the wetlands and one site in Ballona Creek opposite the west tide gate. Incoming flood and outgoing ebb tides were sampled during each sampling event at each station.

Water from Ballona Creek was the main source of indicator bacteria in the wetlands. Within the tidal channels, densities ranged from 10^3 - 10^4 cfu/100 ml for total coliforms, and an order of magnitude lower for *E. coli* and enterococci; densities increased an order of magnitude after two rain events. For each indicator bacteria, the ratio of flood:ebb density at each station was regressed with the tidal range for that event. Although values of R^2 were weak (ave=0.2320, range=0.0052-0.4588), the trend was for the ratio to decrease with increasing tidal range, suggesting that more bacteria enter the wetlands on flood tides from Ballona Creek during neap tide conditions, but during spring tides, the ebb flows have greater bacterial densities. High water during maximum tides could be dragging additional bacteria off the tidal channel banks, thus increasing densities in the water flowing back to Ballona Creek.

15. AN ICP-MS STUDY OF CD, ZN AND CU ACCUMULATION IN THE BODIES, CYTOSOL AND JAWS OF THE POLYCHAETE, *NEANTHES ARENACEODENTATA*.

Bernier, S. and Mason, A.Z. Department of Biological Sciences and Institute for Integrated Research in Materials, Environments and Society, California State University Long Beach, CA, 90840.

The relative toxicities of Cu, Cd and Zn to the marine polychaete, *Neanthes arenaceodentata* have been assessed by exposing organisms for four weeks to free ion activities of metal varying from 10^{-7} M- 10^{-12} M for Cd and Zn and 10^{-10} M- 10^{-15} M for Cu. NTA or EDTA were used to buffer the free ion activities of the metals in the seawater. The toxicities decreased in the order $Cu \gg Zn \approx Cd$ with the "non-lethal" thresholds being approximately 10^{-10} M for Cu and 10^{-7} M for Zn and Cd. Tissue analyses for Zn and Cu by ICP-MS showed the concentration of these metals to be highly regulated. In contrast, a dose dependent increase in tissue Cd was observed which, in the worms exposed to Cd 10^{-7} M, was at least partially attributable to the induction of two major pools of Cd binding proteins that could be resolved by directly coupled ion exchange HPLC-ICP-MS. Correlation analyses showed positive ($p < 0.001$) relationships between Mn, Fe and V in control tissues with additional relationships developing upon exposure to Cu, Zn and Cd. Laser ablation ICP-MS of the jaws from control worms showed a spatial gradient in the distribution of metals with Zn, Mn and Mg being the predominant elements at the tip, middle and basal regions respectively. Although exposure to Cd caused detectable increases in Cd throughout the jaw, no effect was noted with either Zn or Cu. It is concluded that while residue analyses of *Neanthes* may prove useful for determining Cd exposure, they are unsuitable for the assessment of Cu and Zn water quality.

This work was supported by NSF grant OCE 9977564 and NIH grant R25 GM 50089

**16. REPRODUCTIVE BEHAVIOR OF THE MALE *Neanthes arenaceodentata*
(ANNELIDA: POLYCHAETA)**

Donald J. Reish and Karin De Collibus, Department of Biological Sciences, California State University, Long Beach—Long Beach, CA 90840

Members of the polychaete family Nereididae reproduce in a variety of ways. *Neanthes arenaceodentata*, and its species complex of *N. acuminata* and *N. caudata*, is unusual in that following egg laying and fertilization within a mucoid tube, the female dies and the male incubates the developing embryos 21-25 days. At this time the juveniles, which had existed on its yolk for energy and growth, leave the male's tube and begin to feed. It was established in preliminary experiments that the male can successfully fertilize and incubate embryos from six successive matings. Female number seven laid eggs but were not fertilized. Both sexes died shortly thereafter. Therefore, under laboratory conditions of 20 °C, the male can live over one year but the female only about 4-5 months. Sex pheromones attract the opposite sex to one another facilitating reproduction; same sex encounters result in fighting which may result in cannibalism. Surrogate males will successfully incubate developing embryos for the 21-25 day incubation period, but the number of juveniles emerging at the end of this time is reduced significantly. The working hypothesis in this study is that the number of emerging juveniles at the end of the incubation period is reduced with each successive reproduction. Experimental protocol was standardized. Worms used in this experiment were taken from the laboratory colony which was established from six worms collected from Los Angeles Harbor in 1964; it is estimated that the population has undergone nearly 200 generations in the laboratory. Worms were placed in individual petri dishes shortly after emerging from the male's tube to insure, especially young males, that they had not previously reproduced. Males initially weighed 60 ± 5 mg wet weight and were placed with females with developing eggs in her coelom and weighed 70 ± 10 mg wet weight. They were fed the green alga *Enteromorpha* weighing 260 ± 10 mg wet weight as needed, usually three times a week. The alga had been collected at one time previously from the field, frozen and thawed before use. At the time of writing this abstract, some males had successfully reproduced four times and have been placed with the fifth female. The data thus far generated does not support the working hypothesis.

**17 THE GYPSUM RIDGE LOCAL FAUNA, AN EARLY PLEISTOCENE
VERTEBRATE ASSEMBLAGE FROM TWENTYNINE PALMS, SAN
BERNARDINO COUNTY, CALIFORNIA.**

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Paleontological collecting forays between 1997 and 2003 in the Gypsum Ridge Training Area of the Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, San Bernardino County have yielded a diverse early Pleistocene terrestrial vertebrate assemblage of early Irvingtonian age. Since its first documentation in 2001, the fauna has significantly increased in diversity. Paleomagnetic data collected through the fossiliferous section indicate that the entire sequence appears to be reversed and accumulated during the Matuyama Chron. Biostratigraphy provides the strongest evidence supporting an early Pleistocene age for this assemblage. The stratigraphic context of the fossiliferous sequence fifty-five feet in thickness suggests a prograding alluvial fan onto an alkali lake with internal drainage. The fauna contains the slug *Deroceras* sp., anurans, reptiles including snakes, lizards, and the tortoise *Hesperotesto*,

shore birds and rails, and mammals including edentates, insectivores, rodents, lagomorphs, carnivores perissodactyls, artiodactyls and *Mammut*. The stage of evolution of the packrat *Paraneotoma* coincident with the joint occurrences of *Erethizon* sp., *Paramylodon harlani*, *Nothrotheriops texanus*, *Ondatra idahoensis* and *Sigmodon medius* support an age of between 2.0 to 1.7 Ma. The presence of *Repomys* n. sp. is a significant range extension for a taxon normally found in late Hemphillian and early Blancan faunas. Other rodents include *Eutamias* sp., *Perognathus* sp, cf. *Dipodomys*, and *Reithrodontomys* sp. Lagomorphs include *Hypolagus* cf. *furlongi*, *Sylvilagus* sp. and *Lepus* sp. The only carnivore is *Bassariscus* sp. *Sigmodon* is the by far the most abundant rodent suggesting a moist warm climate during the time of deposition.

18. A LATE PLEISTOCENE (RANCHOLABREAN) VERTEBRATE ASSEMBLAGE FROM OCEANSIDE, SAN DIEGO COUNTY, CALIFORNIA.

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A late Pleistocene vertebrate assemblage was recovered during grading for the Wanis View Estates housing development along the San Luis Rey River, east of the city of Oceanside, northwest San Diego County, CA. Both macro- and microvertebrate fossils were recovered from rocks representing a transgressive sequence of lake muds and floodplain deposits that accumulated in response to rising sea level. These deposits range in elevation from 6 to 41 meters (15-135 feet) and are here tentatively correlated with the Guy Flemming marine terrace, dated at 345 ka. The underlying unit, previously mapped as the middle Eocene Santiago Formation, is here assigned to the Sespe/Vaqueros Formation based on lithology and the presence of micromammals of Arikarean (late Oligocene/early Miocene) age. A diverse assemblage of late Pleistocene fish, amphibians, reptiles, birds, and mammals were collected during excavation activities. The freshwater fish assemblage contains *Eucycogobius*, *Cottus*, *Mugil*, *Gasterosteus*, and *Gila* (or *Rhinichthys*) and is the most diverse for all southern California sites. Other lower vertebrates including the anurans *Bufo* and *Hyla*, and the pond turtle *Clemmys*, corroborate the sedimentological evidence for a lacustrine depositional environment. The mammalian fauna is represented by *Urocyon*, *Sylvilagus*, *Spermophilus*, *Thomomys*, *Perognathus*, *Reithrodontomys*, *Neotoma*, *Microtus*, *Equus*, *Tapirus*, *Bison*, *Mammut*, and *Mammuthus*, and is typical of other Rancholabrean faunas from Western North America.

19 PLEISTOCENE VERTEBRATES OF THE LOS ANGELES BASIN AND VICINITY (EXCLUSIVE OF RANCHO LA BREA): AN UPDATE

Sherri M. Gust, Cogstone Resource Management Inc.

Numerous Rancholabrean fossils have been recovered since Miller published on this subject in the early 1970s. Fossils recovered from projects in southern California are compared to one another and to the community represented at Rancho La Brea. Taxonomic representation, proportion of herbivore and carnivores, and selected summary measurements are presented illustrating both the similarities and differences.

20. A LARGE FOSSIL FLORA FROM THE PLEISTOCENE OLDER ALLUVIUM, TRIPLE M RANCH, CORONA, CALIFORNIA.

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During excavations for construction of a housing development known as the Triple M Ranch near Corona in Riverside County, California, a collection of over 1000 fossil leaf impressions were salvaged from sediments of an unnamed Pleistocene unit mapped as "Older Alluvium". To mitigate the adverse impacts of project earth moving on these important paleontological resources, the fossil leaf specimens were submitted to a paleobotanist for identification and age and paleoenvironmental interpretations prior to their being accessioned into a public museum.

The Triple M Ranch Flora is low diversity, containing only about 16 taxa and including oaks, chaparral, dogwood, madrone, chinquapin, mountain mahogany, sycamore, aspen, sumac, willows, grasses, cattail, and 2-needled pines. Conspicuous by their absence are ferns and other conifers. This fossil leaf assemblage clearly represents a typical Southern California scrub oak chaparral community.

The presence of vegetation typical of the same area today suggests that the climate in which the vegetation grew was similar to the present Mediterranean climate -- warm temperate to subtropical, with a long, hot and dry summer and a short, mild and wet winter. The depositional environment is interpreted as a shallow pond or lake and leaf remains were probably transported to the site either by rain-swollen streams during winter rains or during summer flash floods. Because the pond deposits are at the base of a conglomerate shed during uplift of the Santa Ana Mountains, the flora possibly chronicles vegetation prior to and during the uplift.

21 DEPOSITIONAL HISTORY AND PALEOENVIRONMENT RECONSTRUCTION OF A MIOCENE MAMMAL AND BIRD TRACK SITE WITHIN BASIN FILL SEDIMENTS OF THE COPPER AND COFFIN CANYONS, DEATH VALLEY NATIONAL PARK, CALIFORNIA

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A sequence of conglomerate, clay, siltstone, evaporates and basalt flows exposed within Copper and Coffin Canyons, Death Valley National Park represent over 3000 meters of basin fill sediments deposited in a tectonic setting involving major crustal extension, faulting, basin formation, deposition, and subsequent uplift. The Copper and Coffin Canyon basin fill deposits are significant because they preserve the richest, most diverse, Cenozoic vertebrate fossil track assemblage in North America and possibly the world. To date, thirty-six ichnospecies of cat, camel, horse, mastodon, and bird tracks have been identified from the lakeshore sediments of Copper and Coffin Canyons. These tracks represent a diverse fauna of large terrestrial mammals and birds, many of which have no body counterparts in the fossil record. The Copper and Coffin Canyon basin fill deposits are part of a succession of middle Miocene through Pliocene basin fill deposits that define the Furnace Creek Basin and the northern portion of Death Valley Basin. Temporally and lithologically the Copper and Coffin Canyon basin fill deposits are part of this succession however, up to now, previous workers have overlooked them. Work is currently underway to: (1) reconstruct the conditions that attracted and were responsible for the preservation of the Copper and Coffin Canyon tracks; (2) determine why the tracks are so abundant within the Copper and Coffin Canyons and why similar lithologic deposits are void of tracks; and (3) acquire radiometric dates such that the Copper and Coffin Canyon basin fill deposits can be stratigraphically and biostratigraphically applied to the geologic time scale.

22. FOSSIL MARINE FISH FAUNA FROM A LATE PLEISTOCENE SITE ON MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA.

Roeder, Mark A., Department of Paleontology, San Diego Natural History Museum, P. O. Box 121390, San Diego, CA 92112

Late Pleistocene shallow water marine molluscan faunas are well documented in the San Diego area. One of these molluscan sites situated above the northeast shore of present day Mission Bay has been called the "Railroad Cut Locality" (RCL). The RCL site was first collected by Stephens (1927) and later by Kern and others (1971). They reported 69 molluscan species and a single vertebrate, *Myliobatis californica*. Amino acid dates place this site at about 300,000 years. A 200-pound matrix sample from this site was water-sieved through 25 mesh-per-inch screens and the remaining concentrate was sorted with the aid of a binocular microscope, yielding bones, teeth, and otoliths of twelve species of marine bony fishes, and eight species of sharks and rays. The RCL fossil fish fauna is dominated by estuarine gobies, *Quietula y-cauda*, *Lepidogobius lepidus* and *Ilypnus gilberti*, that presently inhabit shallows of Mission Bay. But two other estuarine gobies, *Microgobius sp.*, which today lives in southern Baja California, and *Quietula guaymasiae*, that presently inhabits the northern and central Gulf of California, indicate that average ocean temperatures during this time in the Late Pleistocene may have been several degrees warmer than today. Also, the presence of at least 5 species of warm water mollusks, and southern fish species such as *Bairdiella icistia*, and *Rhizoprionodon longurio* argue for elevated ocean temperatures. The recovery of five species of estuarine gobies supports Kern and others' (1971) conclusion that the RCL locality sediments were deposited in waters 1 to 2 meters in depth.

23. RECENT SURVEY WORK NEAR EL GOLFO DE SANTA CLARA, SONORA MEXICO.

C.A.Shaw¹ and **F.W. Croxon III²**. ¹George C. Page Museum, Los Angeles, CA 90036 and ²Western Arizona College, Yuma, AZ 85366

Middle Pleistocene Colorado River Delta deposits exposed in the upper Gulf of California have yielded a diverse vertebrate fauna and associated flora. Late Quaternary doming along the Cerro Prieto Fault has allowed extensive dissection of ancient deltaic sediments in western Sonora, revealing thick fluvial units from which Irvingtonian-aged fossils have been recovered. A collaboration between the Reserva de la Biosfera – Alto Golfo de California y Delta del Rio Colorado (SEMARNAP), Arizona Western College and the George C. Page Museum have initiated a re-survey of the exposures. To date, over 900 mapped vertebrate fossil localities, representing over 55 species, are documented and numerous fossil work sites identified. A digital elevation model (DEM) is used as the base map for spacial and temporal analyses. The differentially corrected GPS data are placed in a GIS platform, allowing for a census of faunal distribution. In addition to the paleontologic survey, detailed GPS mapping of some major faults and related structures, along with measured sections, is being undertaken. These field studies in the past ten years have added in excess of six thousand specimens to a relatively small sample of vertebrates collected between 1939 and 1985. Studies by several colleagues are in progress which involve several mammalian groups including rodents, carnivores, perissodactyls, and cervids. New records of vertebrate species from El Golfo de Santa Clara include unexpected taxa in North American faunas, along with a new species of sheep and antelope.

24. EARLY RECORDS OF EXTINCT *BISON* FROM SOUTHERN CALIFORNIA AND THE BEGINNING OF THE RANCHOLABREAN NORTH AMERICAN LAND MAMMAL AGE

Eric Scott, San Bernardino County Museum, Division of Geological Sciences, Redlands, CA 92374

The Rancholabrean North American Land Mammal Age, named for the mammal assemblage from the Rancho La Brea asphalt deposits in Los Angeles, California, is characterized by the presence of the Eurasian immigrant genus *Bison* south of 55°N latitude. The timing of the arrival of *Bison* in the coterminous United States has not been determined with any certainty, and so the beginning of the Rancholabrean has not been reliably established. Recent studies suggest a date younger than ~220,000 years before present, but estimates vary.

Land mammal ages are defined in faunal terms, and faunas do not manifest themselves across the entirety of a continent in a geologic instant. As a result, these ages are time-transgressive rather than synchronous. In the case of the Rancholabrean, this diachronous nature may be quantifiable due to the abundance of Pleistocene localities and the precision of radiometric dating techniques.

In southern California, reports of early records of Pleistocene *Bison* from the region are generally poorly supported. Early records of *Bison* from the Murrieta region in Riverside County, and from Lake Manix in the Mojave Desert, were based upon misidentified elements. Other early records of *Bison* from coastal southern California were recovered from sites with complex stratigraphy; these finds often lack reliable stratigraphic context. These examples emphasize the importance of both precise identifications and detailed contextual data when interpreting the age of fossils of extinct *Bison*, particularly in cases where those records may help define the beginning of the Rancholabrean, both regionally and continentally.

25. RALPH B. CLARK REGIONAL PARK: AN UNTAPPED TREASURE TROVE OF PLEISTOCENE FOSSILS.

Lisa C. Babilonia, Ralph B. Clark Interpretive Center, 8800 Rosecrans Ave., Buena Park, CA, 90621.

Located along the western edge of the Coyote Hills in northern Orange County, Ralph B. Clark Regional Park contains a little-known, but significant cache of Pleistocene fossils. Vertebrate and invertebrate remains, both marine and terrestrial, have been found in the following strata: the San Pedro, Coyote Hills, and La Habra Formations. Successively, these rock units represent a local, regressive marine event during a time span of 1.4 million to 10,000 years b.p. The fossil collection is housed within the Interpretive Center, located at Clark Park. The collection consists primarily of fossils found within the park as well as recent additions from other Pleistocene localities along the Coyote Hills region.

26 SHOULD I STAY OR SHOULD I GONAD? SITE FIDELITY AND SEASONAL MOVEMENT PATTERNS OF CA SHEEPHEAD (*Semicossyphus pulcher*)

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The California sheephead, *Semicossyphus pulcher* (Labridae), is a temperate, rocky-reef/kelp-bed fish that is sought by recreational and commercial fishermen. No-take marine reserves may be an

effective management strategy that could protect stocks, but first, it is necessary to determine the movement patterns and site fidelity of this fish. We have used short-term acoustic tracking to determine home ranges of sheephead; however, this method was not sufficient to determine long-term stability of their home ranges or seasonal movements. Therefore, 16 additional adult sheephead were fitted with long-term (~ 1 yr) transmitters and their presence and movement patterns in a no-take marine reserve were monitored by an automated acoustic receiver array. Short-term tracking has shown that sheephead revisit locations each day and had relatively small home ranges (< 82,000 m²). The long-term acoustic monitoring data confirms that these sheephead generally have a high degree of fidelity to the areas of the reserve, spending 92% of their days within the reserve area, with most fish utilizing a core area encompassing 2 to 3 monitors (<600 m linear distance). However, these fish showed some variability in area use between months, exhibiting periods of expansion in their range between December and March (non-spawning period), with fish visiting areas previously unutilized. Water temperature also appears to have a significant effect on activity and distance fish moved. In some cases these expanded movements resulted in the fish crossing the reserve boundary for an extended period or leaving the reserve permanently, potentially exposing the fish to capture.

27. THE FISH ASSEMBLAGES INSIDE AND OUTSIDE OF A MARINE RESERVE AT SANTA CATALINA ISLAND, CALIFORNIA

Froeschke, John T. Nearshore Marine Fish Research Program, California State University, Northridge, Department of Biology, 18111 Nordhoff St. Northridge CA, 91330.

The fish assemblage of the rocky reef kelp forest habitat of Santa Catalina Island, California was compared inside and outside of a marine reserve. Two sites inside and out of a marine reserve were sampled approximately quarterly using visual census on SCUBA at depths of six and 12 meters from October 2002 to February 2004. On each sampling date, divers swam a 2 m wide x 50 m long transect counting all conspicuous fishes within the 100m² area and assigning each fish to one a five size classes (adult, sub-adult, juvenile, young of year or recruit). Twenty-three species from 14 families were observed on transects during this period. The assemblage was dominated by warm temperate and subtropical species including pomacentrids, gobiids, labrids and serranids. Species richness was similar at all sites however, the relative abundance of some species differed between reserve and non reserve sites. Densities of adult sheephead (*Semicossyphus pulcher*) and kelp bass (*Paralabrax clathratus*) were significantly higher inside the marine reserve. There were no strong seasonal patterns of abundance in the assemblage of fishes. Overall, these data indicate that a small marine reserve may effectively protects some recreationally important species from harvest and ultimately may lead to enhanced stocks of these fishes at non-reserve locations through larval export and/or adult emigration.

28. RECOMMENDATIONS FOR A RESERVE IN LA JOLLA BASED ON PATTERNS OF HABITAT, DIVERSITY, AND OCEANOGRAPHIC CLIMATE.

P.E. Parnell, C. Lennert-Cody, and P.K. Dayton, Scripps Institution of Oceanography, UCSD, La Jolla, CA, 92093-0227.

An extensive underwater survey of the La Jolla kelp forest was conducted during the spring and summer of 2002. The main purpose of the survey was to develop an extensive database on the resources and biological communities within hard-bottom habitats throughout La Jolla to help

determine the effectiveness of the San Diego-La Jolla Ecological Reserve, which was established over thirty years ago, and to make recommendations for a more effective reserve if necessary. The Reserve protects the confluence of four different habitats: the extreme northern margin of the La Jolla Kelp Forest, a shallow boulder-reef habitat, the head of a submarine canyon, and a gently sloping sandy shelf. The Reserve is relatively small (533 acres) and was not designed to achieve specific goals. Based on patterns of habitat, diversity, and oceanographic climate, we recommend no changes to the existing Reserve and the establishment of a new reserve protecting the southern half of the La Jolla Kelp Forest.

28a. EFFECTS OF WARM WATER DISCHARGES FROM THE MORRO BAY POWER PLANT ON HARD BOTTOM BENTHIC COMMUNITY STRUCTURE: FOLLOW-UP STUDIES TO DR. W.J. NORTH'S 1967/68 SURVEYS

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Warm water effluent from the Morro Bay Power Plant (MBPP) is discharged through a constructed canal into Estero Bay, central California. Morro Rock is the only rocky habitat in the immediate vicinity. The thermal plume contacts the north side of Morro Rock, exposing the intertidal and subtidal benthic communities to increased water temperatures. The warm water has been influencing benthic algal and invertebrate composition in these communities for almost 50 years, since the MBPP began commercial operation in the early 1950s.

Dr. W.J. North did the first thermal investigation of the area in 1967/68. North found fewer species on the north side of Morro Rock that is directly exposed to the thermal plume compared to the west side that receives little or no temperature increases. We re-surveyed the same areas in 1999 and 2001. Although information is lacking on community changes over the intervening period between North's study and ours, the results from both studies are consistent in having detected differences in community composition with distance from the discharge. We were able to use indicator species (e.g., *Mazzaella flaccida*, *Laminaria setchellii*), as revealed in our thermal effects studies at the nearby Diablo Canyon Power Plant, to explain some of the community differences on Morro Rock being related to water temperature, and used indicator species to determine the spatial extent of thermal effects on Morro Rock.

The MBPP ceased operation in 2003. This now provides an opportunity to examine recovery, and an opportunity to validate our thermal effects evaluation based on the distribution of indicator species.

28B GETTING READY FOR THE "BIG ONE": NATIONAL OILSPILL DRILL IN SOUTHERN CALIFORNIA AND ATTEMPTS TO REDUCE NEARSHORE IMPACTS USING DISPERSANTS.

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On April 20-23, 2004, over two thousand people from a variety of agencies and the oil industry conducted a major Spill of National Significance (SONS) oil spill drill in Southern California.

The drill scenario involved a tanker releasing several million gallons of Arabian crude oil in San Pedro Bay, followed shortly by a second incident off Point Loma, spilling several hundred thousand gallons of heavy fuel oil. Command posts, populated by federal, state and industry responders, were established at Terminal Island and in San Diego. Networks were set up to communicate with Sacramento and Washington DC. Within 24 hours, shorelines of Orange County (Huntington Beach to Dana Point) were about to be impacted by several million gallons of emulsifying crude oil. Industry skimmers and boom teams were deployed within hours. Local agencies were notified and beaches and fisheries closed down. State and federal agencies sought and received approval to apply dispersants from aircraft, shoreline and damage assessment teams were set up and deployed to survey and recommend clean up actions and criteria, and wildlife recovery teams mobilized facilities to deal with thousands of oiled birds. A special issue was approval and use of chemical dispersants to reduce impacts of floating oil to birds, wildlife and shorelines. NOAA's HazMat team provided trajectory forecasts for both floating oil and dispersed oil in the water column. The dispersed oil plumes moved nearshore, exposing kelp beds, reefs and nearshore subtidal marine life to dispersed oil at concentrations in the range of 0.5 to 10 parts per million for up to 24 hours. It was concluded that such exposure would not affect kelp, seagrass, adult fish or adult crustaceans, but could injure reproductive products and plankton. The drill was successful in overwhelming agency resources and initiating important new discussion about response preparedness and tradeoffs.

29. STATUS OF THE KELP BEDS OF ORANGE AND SAN DIEGO COUNTIES IN 2002 WITH A REVIEW OF THEIR STATUS THROUGH 2003

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In the previous two and one half decades, kelp beds in Orange and San Diego Counties have been repeatedly affected by a continuing series of El Ninos. Although the latest El Nino was in 2003, its effects were exceedingly mild on the extant canopies of the region. A cooling trend interrupted by one relatively mild El Nino has resulted in continued growth of most of the canopies along this portion of the coastline. However, during the El Nino of 1997-1998, kelp beds were decimated in San Diego and Orange Counties leaving kelp resources at their lowest ebb recorded during the century. In 1999, we began a slow but steady march back from that brink to a substantial recovery of the resource: Although all the beds lost biomass, not all of the beds recovered as rapidly or completely. By looking at the long-term record on a regional basis, we explore herein the reasons for these incongruities. A database to assess these changes was available as quarterly kelp bed aerial surveys are a requirement, since 1983, of discharge permits into the offshore waters under the jurisdiction of the San Diego Regional Water Quality Control Board and because the late-Dr. Wheeler North of Caltechs' Kerckhoff Marine Laboratory had been collecting aerial photos of these beds since 1967. By means of aerial infrared photography, the 24 distinct beds that occur offshore of Orange and San Diego Counties were recorded as best as possible at the maximum areal extent of any canopies during the year. Although the intention was that a synoptic survey of the beds would allow a determination of the potential effects of waste water (both heated effluent and sanitary) on the kelp beds, insight is provided, through the medium of aerial photographs, on the kelp beds response to and the aftermath of the this El Niño.

Based on these data, a synopsis of the health of each of the kelp beds and the effects of these environmental perturbations, as it compares with the other kelp beds in the region, can be determined. Although it is not possible to determine the cause of a decline or decrease in a single kelp bed by aerial photographs, it does determine whether the bed in question is responding to an area wide event, or if it is atypical of the beds in the region. Atypical beds can then be categorized according to their distance from other beds, substrate depth, and potential biological factors.

Looking at these factors can then offer some insight as to the cause and effect of the differences noted.

30. THE SAN CLEMENTE ARTIFICIAL REEF – EXPERIMENTAL PHASE KELP WRACK STUDY RESULTS

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The San Clemente beach is being monitored to determine if reef material and/or kelp wrack from the adjacent 22.4-acre San Clemente Kelp Experimental Artificial Reef (SCAR) is having an affect on beach conditions. This study is directed by the California Coastal Commission and is conducted by Southern California Edison. Two materials, broken concrete and quarry rock, and three bottom coverage densities, 17%, 34%, and 67%, are being tested on SCAR, offshore of the San Clemente beach, to discern the best design for the build-out of this kelp mitigation reef to 150 acres. The experimental reef was built in September 1999 and is in about 45 feet of water, ½ mile off the beach and spans about 2.5 miles of beach frontage. In the project's environmental review phase, concern was raised about the potential of reef material washing up on the beach, and kelp wrack increasing substantially. To date, the routine observations of the San Clemente beaches show no artificial reef material, either quarry rock or concrete, is washing onto the beach. Further, kelp wrack from the artificial reef does not appear to be making a substantial contribution to the limited amount of seaweed wrack that periodically appears on the beach. The program scientists are now awaiting some significant storms, wave events, and/or El Niño-type events, as the study period, 1999-2004, has included only limited stormy conditions. The assumption is that "sea-change"-type (episodic/catastrophic) events drive the system, and the experimental study period has yet to encounter these events.

31. GLOBAL MONITORING OF TEMPERATE REEF ALGAL COMMUNITIES

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Global climate change has the potential to dramatically alter the distributions of algal populations in temperate reef communities. The detection of these broad scale fluctuations, however, will require discriminating them from the frequent local scale fluctuations that occur in these populations. We are beginning a NASA sponsored project to create a global scale monitoring program of kelp populations based on a variety of satellite imagery. Earth Satellite Corporation has produced a world-wide mosaic of cloud-free LandSat 7 ETM+ images for the year 2000. We will be processing the coastal images from this series to quantify the surface area of nearshore kelp canopies. The ETM+ imagery has a spatial resolution of 30 m in the infrared channel and 15 m in a panchromatic channel that extends into the near-infrared. We will be testing the efficiency of this imagery, as well as higher spatial resolution imagery from the ASTER instrument, for quantifying the population size of kelp populations. A series of validation studies will be conducted in Baja California and Chile to correlate the satellite data with diver collected population data. We will also analyze AVHRR satellite imagery on a global scale to quantify sea surface temperature distributions and anomaly patterns that can be compared with changes in kelp canopy abundances. An interactive web site with internet map server capabilities, analogous to the web sites monitoring change in tropical coral reef communities, will be developed to help provide a global view of kelp population changes.

32. EFFECTS OF BEACH REPLENISHMENT ACTIVITIES ON NEARSHORE MARINE HABITATS

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Over the past two decades, San Diego's shoreline has experienced chronic and continuing erosion. In an effort to restore many of the beaches, SANDAG in 2001 implemented the Regional Beach Sand Project which dredged just over two million cubic yards of sand from four offshore borrow sites and replenished 12 beaches along the coast of San Diego County. Concern from resource agencies and commercial fishermen regarding the potential for the sand placed on the beaches to impact nearby reefs promulgated monitoring of rocky intertidal, shallow subtidal, and kelp forest habitats in the vicinity of select receiver sites. Since implementation, there has been varied response and this presentation will discuss 3 years of shallow subtidal and beach profile monitoring data regarding coastal processes and its effect on nearshore reefs.

33. SIZE-DEPENDENT PREDATION ON TWO TEMPERATE-REEF FISHES: CAN CONFLICTING RESULTS FROM FIELD AND LAB STUDIES BE RECONCILED?

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Mortality rates of fishes generally decline with increasing body size. This pattern is widely believed to be caused by size-dependent predation, that is, smaller fish suffer higher rates of predation than larger fish. There have been, however, relatively few tests for size-dependent predation in marine fishes, and most of these have been made in the lab. It is unclear how well the results of such lab studies can be extrapolated to nature. I used both lab and field experiments to test for size-dependent predation on two abundant southern California reef fishes, the bluebanded goby (*Lythrypnus dalli*) and the blackeye goby (*Rhinogobiops nicholsii*). Lab experiments generally revealed size-dependent predation, but field experiments did not. I speculate that the wide range of sizes of predators present in the field causes all sizes of the gobies I studied to experience roughly equal risk of being eaten. Since a full spectrum of predators is seldom maintained in the lab, I suggest that evidence of size-dependent predation generated by lab study should be viewed with caution and I urge researchers to use field experiments in future studies on this topic.

34. BIOGEOGRAPHY OF THE NEARSHORE ROCKY-REEF FISHES AT THE SOUTHERN AND BAJA CALIFORNIA ISLANDS

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Between June 2000 and August 2002, the nearshore rocky-reef fishes of eight southern and Baja California islands were quantitatively surveyed. The islands surveyed were: Santa Cruz, San

Nicolas, Santa Barbara, Santa Catalina, San Clemente, North Coronado, San Martin and San Benito. These islands span the latitudinal range of offshore islands within the San Diegan marine province. This regional scale approach provided not only the first quantitative description of rocky-reef fishes at five of these islands, but also allowed comparisons with known biogeographic patterns to be made. Here we discuss the distribution and abundance of 84 conspicuous rocky-reef fishes from 35 families. In general, the richness, diversity and composition of fish assemblages at these islands were found to reflect previously described biogeographic processes. The rocky reef fish assemblages of all the islands in the survey were found to be significantly distinctive from each other. Phenetic analyses revealed two clusters. San Clemente, Santa Catalina and North Coronado clustered as a warm water assemblage in the middle of the San Diegan Province. The remaining islands grouped together as a cold water assemblage, despite the geographically disjunct position of the islands within this cluster. The relatedness of islands was independent of distance. Examination of the most common fish species at all islands revealed that while some conformed to the north-south trending density distributions predicted by previous investigators, the distribution of others could not be explained by latitude or temperature regimes. No single pattern explained the density of fishes at all islands.

35. RECRUITMENT OF REEF FISHES IN THE SANTA BARBARA CHANNEL

J.E. Caselle. Marine Science Institute and PISCO, University of CA, Santa Barbara, CA 93106

I monitored recruitment of reef fishes to SMURFs (Standardized Monitoring Unit for Recruitment of Fishes) throughout the Santa Barbara Channel since 2000. There were strong interannual patterns. Rockfishes (*Sebastes* spp) have increased in abundance since 2000 while kelp bass (*Paralabrax clathratus*) have decreased over the same period. Despite year to year variation in abundance, spatial patterns around the Northern Channel Islands were remarkably consistent for most taxa. Preliminary analyses of oceanographic conditions (temperature and current patterns) give some insight into the causes of the observed spatial and temporal patterns.

36. TEMPORAL PATTERNS IN THE SETTLEMENT OF CRYPTIC REEF FISH

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The settlement of reef-associated temperate fishes was monitored during the summer and fall of 2002 and 2003 at King Harbor, Redondo Beach, California. King Harbor is a man made harbor composed of rock reef and sand habitats. A total of eight settlement traps were anchored on the bottom at depths between 2 and 7 meters to provide a standardized form of structural shelter for settling larvae. During the study period divers conducted weekly and bi-weekly retrievals of these traps and all larval fish collected within the traps were preserved for identification and analysis. A total of 126 "new settlers" were collected during the months of July and August 2002 and 254 "new settlers" were collected during the same months of the 2003 season. Throughout the study four different species dominated the collections; *Gobiesox rhesodon*, *Paraclinus integripinnis*, *Hypsoblennius jenkinsi*, *Ruscarius creaseri*. Settlement pulses were then compared to physical anomalies such as moon phase, sea surface temperature, and sub-surface temperature. The influx of new settlers was positively correlated, on a daily basis, with abrupt changes in temperature (ΔT ; $r = 0.48$, $p = 0.003$). Preliminary results indicate that the majority of these reef-fish settlers are being transported inshore by processes that, in turn, also cause large temperature fluctuations in the water near the bottom. In this case, the observed temperature fluctuations were consistent with the occurrence of tidal bores.

37 **LARGE AND SMALL SPATIAL VARIATION IN CRYPTIC REEF FISH ASSEMBLAGES**

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Two reefs of differing depths within King Harbor, Redondo Beach, California, were sampled from January 2000 to September 2002. Fishes were collected from random 1 m² replicates using quinaldine. Multiple microhabitat characteristics were noted for each meter-square plot for small spatial variation analysis. Collections were also made during 2002 at Palos Verdes Peninsula and at two sites on Catalina Island (Salta Verde and Hen Rock) to address questions of large-scale spatial variation. Fourteen species were collected in King Harbor and the top 5 species accounted for 98% of the total numerical density and 95% of the total biomass density. The overall H' diversity was low (0.42) due to the dominance of *Paraclinus integripinnis*. Species richness, H' diversity, number of individuals and biomass were all greatest in the summer and early fall. Canonical correlation analysis of the microhabitat data showed that different species of cryptic fishes show a preference for particular types of algae and depth. Spatial variation was also seen on a large scale. Four of the 7 species collected at the Palos Verdes site were cottids indicating a cold water assemblage. Five species were collected at Salta Verde and only 3 at Hen Rock, but both sites were predominately composed of gobies.

38. **RECENT DEVELOPMENTS IN AUTOMATIC CALIBRATION AND APPLICATION TO HYDROLOGIC MODELING**

Terri S. Hogue, Department of Civil and Environmental Engineering, University of California-Los Angeles

Computer-based hydrologic models have become increasingly complex and are being utilized for numerous hydrologic tasks, including real-time forecasting of pending flood events, urban planning of design storms, and monitoring of water quality runoff, among others. The majority of these models consist of a lumped, conceptual description of the watershed, designed to represent the hydrology of the basin, with numerous parameters that must be estimated. These models are then applied to various climatic and hydrologic regimes and must be "adjusted or calibrated" to fit local hydrologic observations. Once an appropriate model is chosen, the usefulness of the model is highly dependent on the quality of the calibration and how well the model can simulate the desired fluxes or outputs (e.g., streamflow). Most models have been calibrated via the traditional approach, where an "expert" hydrologist with knowledge of the model and watershed system uses a trial-and-error procedure to adjust model parameters while visually inspecting the model simulations as compared to the observed streamflow. Due to the tedious and time-consuming nature of the manual calibration process, researchers in the 1960s began exploring methods that could speed up the calibration process and make it less subjective. Automatic calibration methods help in this regard by utilizing the speed and power of modern computer technology, while being fairly easy to implement and objective to analyze. A brief description of some of these automated technologies, along with their application to the operational hydrologic modeling system of the National Weather Service, will be presented.

39. MODELING WATER AND NUTRIENT EXPORT FROM COASTAL WATERSHEDS IN SOUTHERN CALIFORNIA

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Streamflow (water and associated constituents) from coastal watersheds affects the physical and chemical regime of nearshore marine and estuarine waters. As part of the Santa Barbara Channel – Long Term Ecologic Research Project, our goal is to quantify the terrestrial export of streamflow, nutrients and sediments from southern California's coastal watersheds. The primary component of this effort is the spatial and temporal distribution of streamflow from the coastal watersheds (approximately 100) draining the Santa Ynez Mountains along the southern coast of Santa Barbara County California. We use a generalized watershed-scale rainfall-runoff model (HEC-HMS), calibrated and then verified against local hydrometric records, to derive streamflow time series for each watershed for three water years: 2001-2003, encompassing a both wet (2001/2003) and dry years (2002). The benefit of quantifying time series streamflow from each watershed is that they can be combined with regional relationships between land use, streamflow measures and nutrient export to approximately either annual or event nutrient export to a continuous coastal line. Using this approach, various land use and climate change scenarios can be developed and used to investigate their potential impacts on the export of water and nutrients to the nearshore environment.

40. NUTRIENT MANAGEMENT IN THE SAN JACINTO WATERSHED, CALIFORNIA

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Andrew Parker, **Stephen Carter**. Tetra Tech, Inc., Fairfax, Virginia
Hope Smythe, Xinyu Li. Santa Ana Regional Water Quality Control Board, Riverside, CA

The Santa Ana Watershed Protection Authority is coordinating a watershed assessment and modeling study to support development of TMDLs for Lake Elsinore and Canyon Lake, as well as development of a nutrient management plan for the San Jacinto Watershed. Both lakes have exhibited eutrophic conditions in recent years that have triggered periodic fish kills. The effort has involved development and application of a watershed and lake modeling system that evaluates nutrient sources and transport under a range of hydrologic regimes.

EPA's Loading Simulation Program in C++ (LSPC) was used to simulate watershed processes, including hydrology, pollutant accumulation and washoff, and flow and pollutant transport in the streams and headwater lakes. LSPC was calibrated and validated for hydrology and nutrient loading at multiple locations. A simplified one-dimensional Environmental Fluid Dynamics Code (EFDC) model was developed to simulate nutrient loading impacts on Canyon Lake and transport to the downstream lake, Lake Elsinore. EFDC is capable of simulating hydrodynamics, salinity, temperature, suspended sediment, water quality, and the fate of toxic materials. It was successfully calibrated to available hydrodynamic and water quality data for a multi-year period covering mean, dry, and wet years.

Various alternative loading scenarios have been simulated with the LSPC and EFDC models, in order to test the sensitivity of various nutrient source loadings to lake water quality response. The comprehensive modeling system, composed of both the LSPC and EFDC models, provides the basis for making future management decisions in the watershed.

41. HYDRODYNAMIC MODELING OF FECAL INDICATOR BACTERIA IN TALBERT MARSH BASED ON LOADS FROM URBAN RUNOFF, BIRD FECES, AND RESUSPENDED SEDIMENTS

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Talbert Marsh in Huntington Beach, California is an estuarine, intertidal wetland where enteric bacteria concentrations chronically exceed State recreational water contact standards. It has been reported that during dry-weather periods Talbert Marsh is a net generator of enterococcus bacteria, contributing fecal pollution to coastal waters at Huntington Beach. Hydrodynamic modeling was conducted to study the extent to which loading of total coliform, *E. coli*, and enterococci by urban runoff, bird feces, and/or resuspended sediments control surface water concentrations in the marsh. In this presentation, the modeling approach adopted for this study will be described, an assessment of the model's ability to accurately predict fecal indicator bacteria will be presented, and the implications of the model predictions, in terms of the factors driving water column concentrations of enteric bacteria, are discussed.

42. DYE DISPERSION IN THE SURF ZONE: MEASUREMENTS AND SIMPLE MODELS

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To examine the spatial and temporal effect of low-volume landbased runoff on beach contamination, batches of dye were released at the shoreline at 3 beaches in Santa Monica Canyon in 2000 (Malibu Creek, Santa Monica Canyon and Pico Kenter drain). Dye concentration was measured at the shoreline 25m, 50m and 100m alongshore from dye release point for up to 40 minutes after dye release. The shoreline concentration time series reveal distinct characteristics in dye plume dispersion, the potential causes for which are investigated using a series of simple models to simulate shoreline concentration time series for an idealized surf zone. Favorable qualitative and quantitative comparison of measured and simulated time series suggest sheared alongshore currents and rip currents play key roles in generating the observed

43. SPATIAL AND TEMPORAL VARIATION IN THE TISSUE HALIDE CONTENT OF THE COASTAL SALT MARSH HALOPHYTE, *SALICORNIA VIRGINICA*

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Coastal salt marshes are home to several different species of salt tolerant vascular plants called halophytes. One dominant species found in southern California is *Salicornia virginica*. I measured the amount of chloride, bromide and iodide in *S. virginica* tissue from three different sites, each located at different elevations in relation to tidal flux. This is the first report of values

of the three halides from a California salt marsh species. Tissue samples were taken once a month for 13 months and analyzed for halides using a specific ion electrode based method (Grans analysis of potentiometric titration). Mean concentration (g dwt⁻¹ ± S. D.) of chloride ranged from 11.2 ± 0.4 to 43.3 ± 8.0 %, bromide from 0.27 ± 0.02 to 1.84 ± 0.39 %, and iodide from 3.0 ± 2.1 to 1.2 × 10⁴ ± 3.8 × 10³ ppm. Results indicate significant differences, (p < 0.0001), in mean concentration among months and a significant interaction (p < 0.0001) between month and elevation for all three halides. The mean concentration of chloride was greater than values reported for other species of *Salicornia*. Several monthly values for iodide were extremely high but dropped precipitously thereafter. Very few environmental factors appeared to correlate with changes in halide tissue values. The mean tissue halide (wt/wt) ratios from all three elevations for the sampling period were 190 Cl⁻:3.18 Br⁻:1.0 I⁻ compared to a seawater ratio of 1.5 × 10⁶ Cl⁻:5200 Br⁻:1.0 I⁻. These results are discussed in terms of halide bioavailability and selective uptake.

44. EFFECTS OF DISPERSAL ON LOCAL DISTRIBUTION OF THE GRANITE SPINY LIZARD, *SCELOPORUS ORCUTTI*.

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Dispersal of individuals from their natal site occurs for various reasons, including, avoidance of inbreeding and competition between closely related individuals. Distribution of individuals within a population is, therefore, determined by dispersal of different sex and age categories. In long lived, late maturing lizards, dispersal of individuals may occur at various times. *Sceloporus orcutti*, the granite spiny lizard, is a primarily rock dwelling lizard that is non-territorial, but occupies distinct home ranges and reaches sexual maturity at 3 years of age. Based on snout-vent length individual lizards are placed into one of three age categories (juvenile, immature, adult). To examine the pattern of dispersal of sexually immature individuals in *S. orcutti*, I used mark-recapture methods in a population on Lake Mathews Reserve, Riverside County, CA. To investigate local distribution of *S. orcutti* I mapped home ranges for 11 adults and basking sites for an additional 36 lizards. I also obtained DNA samples for genotyping and parentage analysis; however, I found little to no allelic variability which prevented parentage analysis. Results from captures and sightings indicate that *S. orcutti* are dispersing as immatures. I found juveniles clustered on the same rock outcropping, while most immature lizards were solitary. Due to the lack of genetic variability further field observation during the spring of 2004 of previously marked individuals will be used to add insight to dispersal patterns in *S. orcutti*.

45. GEOLOGY AND PETROLOGY OF A MIOCENE DACITE DIKE SWARM AND COGENETIC VOLCANIC ROCKS, LITTLE CHUCKWALLA MOUNTAINS, CALIFORNIA.

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The Little Chuckwalla volcanic field comprises 1.5 kilometers of lava and pyroclastic flows ranging from basalt to rhyolite. The Little Chuckwalla field and others like it attest to explosive volcanism that was widespread during the early Miocene when the Farallon plate was being subducted beneath western North America. The stratigraphy of the Little Chuckwalla field and swarms of cross-cutting feeder dikes are entirely exposed thanks to late Miocene tilting of approximately 30° toward the southeast. The excellent exposure presents the relatively rare

opportunity to study the cogenetic plumbing and erupted deposits of a subduction-related volcanic system. One prominent dike swarm comprises porphyritic dacite with uniquely high abundances of large blocky plagioclase phenocrysts. This dike swarm probably fed petrographically similar dacite lava and pyroclastic flows that are abundant in the upper half of the volcanic pile. The largest dike, up to 100 meters wide and exposed for over 3 km along strike, feeds into a thick, laterally extensive stack of dacite flows. Samples collected from various paleodepths in the dike and from the cogenetic flows are being analyzed to provide input for models of magmatic flow, thermal history, and differentiation during active volcanism.

47. JOINT DYNAMICS OF THE EQUINE FORELIMB DURING JUMPING

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During jumping, a horse (*Equus caballus*) must produce enough power to clear the obstacle using fore- and hind limbs. To investigate the forelimb during jumping, ground reaction forces (1000 Hz) and digital video (250 Hz) were recorded while three horses jumped an obstacle of 0.76m. Inverse dynamic analysis was used to determine the joint moment, power and work generated during stance phase of takeoff stride for the shoulder, elbow, carpus, metacarpophalangeal (MCP), and distal interphalangeal (DIP). The shoulder produced a net flexor moment early in stance and an extensor moment the remainder of stance (peaks: -1.2 Nm/kg, 9% stance, 1.9 Nm/kg, 73% stance). The elbow and MCP joints produced extensor moments with peak values of 2.0 Nm/kg at 50% and 1.6 Nm/kg at 62 % of stance. The average peak negative and positive powers were produced at 23% and 75% of stance (-7.6 & 9.5 W/kg). Total work done by the forelimb was found to be 0.29 J/kg, with 0.25 J/kg produced by the elbow. The shoulder and MCP joints produced a minor amount of positive work. Negative work was produced by the DIP (-0.074 J/kg) and no net work was produced at the carpus. Of the work done by the forelimb while jumping, it appears that the elbow joint makes the greatest contribution. Supported by NIH # S06 GM53933 to DFH & SJW.

48. SUMMERTIME DISTRIBUTION OF THREE SPECIES OF ATHERINOPSID FISHES IN EAST-CENTRAL SAN FRANCISCO BAY

A. Jahn, Port of Oakland and E. Jolliffe, U. S. Army Corps of Engineers, San Francisco District

Nighttime sampling with neuston nets and daytime sampling with purse seines and beach seines were used, principally in June and July, to describe the distribution of larval and juvenile silversides (family Atherinopsidae) and other epipelagic fishes in the vicinity of a least tern (*Sterna antillarum*) breeding colony at Alameda Point in eastern central San Francisco Bay. All nets had 1.6-mm, knotless mesh. Three species of silverside, topsmelt *Atherinops affinis*, jacksmelt *Atherinopsis californiensis*, and California grunion *Leuresthes tenuis*, were captured. Larvae of all three silversides were taken in shallow intertidal areas, including a newly created beach in Middle Harbor, Oakland. Small (≤ 50 mm) juvenile silversides were relatively abundant in protected sub-embayments, but captured in low abundance in waters >5 m deep or >300 m from shore. Larger (>50 mm) jacksmelt and grunion, and to a lesser degree, topsmelt occurred in moderate abundance farther from shore on the warm (approximately 19°C) shoal (< 8 m deep) south of Alameda Island, but jacksmelt was the only silverside species common in deeper, cooler ($<18^\circ$ C), and more exposed waters. Purse seine catches of silversides and other species

decreased after about 0900 or 1000 hrs PDT, possibly due to vertical migration. Because the average time of day of purse seine sets was 1020, and varied by about 1 hr among stations, we believe that the neuston data are the more accurate descriptor of offshore abundance patterns for silversides in this 2003 data set.

49. STANDARD AND ROUTINE METABOLISM OF KELP BASS *PARALABRAX CLATHRATUS*

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Kelp bass (*Paralabrax clathratus*) are common inhabitants of the kelp bed community. As top-level predators, kelp bass feed on a variety of organisms such as squid, octopi, crabs, shrimps and other fishes, and thus play an important role in the local food web. By knowing the minimum energy requirements of a fish such as the kelp bass, it is possible to determine the minimum needed prey consumption and the subsequent impact of this consumption on the prey population. One method used to quantify trophic interactions is through the use of energy budgets, which represent how fish allocate ingested energy. The goals of this study were to measure routine and standard metabolism of the kelp bass, and incorporate these data into an energy budget. Metabolism was determined by measuring the oxygen consumption of the fish in a static respirometer. Oxygen consumption data was then converted to metabolic rates. To date, I have completed 24-hour runs on a total of 16 fish, ranging in size from 115-500 g (16-28cm S.L.), and 6-hour runs on 2 kelp bass recruits (3g). Oxygen consumption rates for kelp bass (52-220 mg O₂ kg⁻¹ hr⁻¹) are comparable to other studies. The mass specific equation for these fish is $y = 258.7x^{0.2619}$. Lab measurements of growth are underway, and these data combined with metabolic data and waste data from literature will be used to construct an energy budget.

50. MASS SIZE DISTRIBUTIONS AND DRY DEPOSITION FLUXES OF TRACE METALS MEASURED IN THE LOS ANGELES AIR BASIN.

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Size segregated air concentrations and dry deposition fluxes of trace metals were measured directly in the Los Angeles Air Basin using a Noll Rotary Impactor (NRI) and deposition plates with aerodynamic surrogate surfaces. Fluxes were also estimated indirectly from the concentration measurements using theoretical expressions for the deposition velocity. The fluxes of Cu, Pb, and Zn in urban areas (annual mean of 22.46, 18.98, and 131.98 µg/m².day) were substantially higher than in non-urban area (annual mean of 4.07, 1.58, 17.10 µg/m².day). The use of deposition plate for direct flux measurement was found to agree well with those indirect flux estimations using calculated deposition velocities. The average dry deposition velocities for coarse particle size fraction were 0.44 ± 0.01 cm/sec for range of particle diameter 6-11 µm, and up to 12 ± 0.1 cm/sec for particle diameter 29-60 µm. Although most of the particle mass was in the small size ranges, the deposition fluxes were controlled by larger rapidly-depositing particles. The diurnal patterns of the total particulates deposition fluxes were determined by microscopic image analysis of the NRI samples. Mean daytime fluxes of the total particulates at urban sites were significantly higher than in non-urban area, but the night time mean fluxes were slightly lower than in non-urban area.

51. GENE EXPRESSION OF AMYLASE BY *IN SITU* HYBRIDIZATION IN CARNIVOROUS AND HERBIVOROUS PRICKLEBACK FISHES: ONTOGENETIC, DIETARY, AND PHYLOGENETIC EFFECTS

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We measured intensity of amylase gene expression in four species of carnivorous and herbivorous prickleback fishes (family Stichaeidae) and determined the effects of ontogeny, diet, and phylogeny on this intensity. Of the four species, *Cebidichthys violaceus* and *Xiphister mucosus* shift to an herbivorous diet as they grow (>45 mm SL), whereas *X. atropurpureus* and *Anoplarchus purpureus* remain carnivores throughout life. *A. purpureus* belongs to a carnivorous clade, and the three other species belong to an adjacent, herbivorous clade. Gene expression of this carbohydrase in the four species was determined using *in situ* hybridization with an RNA probe and the intensity of expression quantified using image analysis. Intensity was compared in three feeding categories of the four species: (1) small, wild-caught carnivorous juveniles; (2) larger, wild-caught juveniles, of the two carnivorous species and the two that have shifted to herbivory; and (3) larger, juveniles produced by feeding a high-protein diet to small juveniles until they reached the size of the larger wild-caught juveniles. Comparisons of intensity in categories (1) vs. (2) allowed us to test for an ontogenetic effect, in (2) vs. (3) for a dietary effect, and within categories (1) and (2) for a phylogenetic effect. Our results showed no dietary effect in any species but significant ontogenetic and phylogenetic effects with the members of the herbivorous clade, *C. violaceus*, *X. mucosus* and *X. atropurpureus*, all increasing amylase gene expression with size and having higher expression than *A. purpureus*, thus showing the importance of this carbohydrase in the herbivores.

52. A PETROGRAPHIC ANALYSIS OF A PALEOSOL IN THE LAS VIRGENES SANDSTONE, SANTA MONICA MOUNTAINS

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A paleosol in the Paleocene Las Virgenes Sandstone is exposed in Solstice Canyon, Santa Monica Mountains. It is approximately 8 meters thick and is divided into four zones. The lowermost zone is highly weathered sandstone. Zone 2 is a mottled interval, and Zone 3 is distinguished by pisolites. Zone 4 is characterized by silica replacement of pisolites and associated kaolinitic matrix. A petrographic analysis of the paleosol reveals that it contains mostly quartz, and a matrix of kaolinite with lesser amounts of highly altered feldspars and biotite. Monocrystalline quartz displaying dissolution features such as etching and embayments dominates all zones. Polycrystalline quartz is less common probably due to disaggregation. Most feldspar and biotite are altered to kaolinite and the kaolinite matrix likely resulted from this alteration. Zone 1 consist of 59% matrix 35% quartz, 5% feldspar, and 1% biotite. Zone 2 averages about 50% quartz, 43% matrix, 6% biotite and 1% feldspar. Zone 3 contains 60% matrix, 30% quartz and 10% pisolites ranging up to 6mm in diameter. Zones 4 consist of 43% quartz, 32% matrix and 25% pisolites, which range up to 3cm in diameter. Partially dissolved quartz grains occur in the cores of some pisolites present in Zone 3 and Zone 4 indicating that they formed after the alteration of the original detrital components. Partially dissolved quartz, kaolinitized grains, and pisolites are commonly associated with soils formed in tropical to subtropical environments. The paleosol studied in the Santa Monica Mountains likely formed in a similar environment.

53. GEOCHEMICAL ANALYSIS OF THE RICARDO VOLCANICS, SOUTHERN EL PASO MOUNTAINS, CALIFORNIA

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Whole-rock and trace element analyses of basalts from the Miocene Ricardo Formation were compared to geochemical data for other Cenozoic basalt fields of the Mojave. Ricardo volcanics have significantly lower alkali ($\text{Na}_2\text{O} + \text{K}_2\text{O}$) content and generally plot as tholeiites on a basalt tetrahedron. In contrast, basalts from other Mojave volcanic fields are distinctly alkaline in character. Ricardo spider diagrams are generally consistent with those for other fields, displaying the characteristic Mojave barium spike and incompatible element enrichment relative to the MORB standard. However, there is a slight depletion of some incompatible elements relative to other Mojave basalts. CIPW analysis of major oxides presents a paradox, Ricardo volcanics are consistently quartz normative, but in thin section olivine phenocrysts are present. Chemical similarities to the Big Pine field suggest the olivine might represent a xenocrystic mantle phase undigested by the Ricardo magmas. Any genetic model must explain the lower alkali content and differing incompatible element concentrations of the Ricardo volcanics. Wang (2002) proposed that Cenozoic basalt composition varies from east to west across the Mojave and is a function of depth of melting. To the east, magmas tap deeper "enriched" mantle that would be expected to have higher alkali and incompatible trace element concentrations. Further to the west, shallower melting would result in slightly more siliceous, alkali-poor magmas from "depleted" mantle. Since the Ricardo field is the westernmost basaltic volcanic field within the Mojave, our geochemical data appears to support this hypothesis.

54. TESTING DIET SWITCHING AS THE MECHANISM FOR THE EVOLUTION OF STRICT HERBIVORY IN LIZARDS

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Herbivory is rare in reptiles and understanding why it evolves has been the subject of scientific speculation for more than 40 years. When captive herbivorous reptiles are raised on a diet that includes animal matter, they grow faster, reach a larger size, and produce more offspring. If eating insects is advantageous for captive herbivorous reptiles, then why don't herbivores eat insects in nature? We are testing the hypothesis that diet switching is energetically costly for herbivorous lizards. When insects become seasonally available, herbivorous lizards can make the switch from herbivory to carnivory without incurring an energetic cost because herbivores can digest animal matter as efficiently as carnivores. However, later in the year, when insects are no longer available, herbivores would have to switch back to eating plants. It is this switch that is predicted to be energetically costly because the endosymbiont community of the hindgut (bacteria and protozoa), which contributes substantially to the host's energy budget by fermenting cellulose into energy-rich volatile fatty acids, may be disturbed by changes in the gut milieu associated with a diet switch. We are assessing digestive efficiency in a model herbivorous lizard (*Dipsosaurus*) before and after diet switches and, using molecular techniques, predicted concomitant changes in the structure of the gut endosymbiont community. If this community is dramatically affected by changes in diet, digestive efficiency should decrease until the community recovers. This presumed disruption is predicted to be so energetically costly that it precludes herbivorous lizards from wholesale switches to eating insects in nature.

55. A POSSIBLE ORIGIN FOR A PALEOCENE QUARTZ-RICH SANDSTONE ASSOCIATED WITH A PALEOCENE PALEOSOL IN THE SAN JOAQUIN HILLS, CALIFORNIA

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Our research focuses on a petrographic comparison of detrital grains found in probable Paleocene paleosols exposed in the Santa Monica Mountains and the San Joaquin Hills, and in an anomalous quartz-rich sandstone also exposed in the San Joaquin Hills. Our preliminary findings suggest that detrital grains in the sandstone were derived from the paleosols. Petrographic results confirm similarities between quartz grains present in the paleosols and the quartz-rich sandstone, such as fracturing, etching and partial dissolution. Additionally, monocrystalline quartz grains are abundant in both the paleosol and the sandstone. These observations substantiate our interpretation that the quartz-rich sandstone is the result of a single cycle of erosion and deposition. Paleosols present in the depositional environment were eroded. Subsequently, the quartz grains originally present in the paleosol were concentrated to form the sandstones. More research is needed to further confirm our findings.

56. PUDDINGSTONE RESEVOIR PLANKTON POPULATION STUDIES, OCTOBER 2002-APRIL 2003

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Ecological assessment of urban reservoirs, such as Puddingstone Reservoir, in southern California's San Gabriel River Watershed, begins with establishment of baseline data for various biological and physical parameters. The purpose of this study has been to characterize the types of plankton and their population fluctuations over several months of the year.

Quantitative samples of plankton were collected in the upper 1 M of surface water from October 2002-April 2003, at approximately 2-week intervals from 2 sites. Numbers of phytoplankton and zooplankton were determined and patterns in population fluctuations were noted. Four main groups of phytoplankton were found: dinophytes, diatoms, chrysophytes, and cyanobacteria. The most common zooplankton consisted of two types of cladocerans and two types of copepods. Phytoplankton populations began with low abundance in October and November and steadily increased, peaking in December and January. A maximum near 800,000/L was seen on 1/26/03.

Zooplankton populations followed phytoplankton population patterns in a classic pattern, reaching their maximum near 500,000/L on 2/15/03. Population fluctuations among the different species of plankton are also discussed.

57. GENETIC DIFFERENTIATION WITHIN AND AMONG PYGMY NUTHATCH (*Sitta pygmaea*) POPULATIONS IN SOUTHERN CALIFORNIA

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We are sequencing mitochondrial DNA genetic markers to analyze the distribution of genetic variation among pygmy nuthatch (*Sitta pygmaea*) populations in southern California. Pygmy nuthatches are small songbirds resident in coniferous forest that occur in disjunct populations both in the mountains and along the central California coast of southern California. In order to determine the extent of gene flow among these disjunct populations, we will use mitochondrial sequence data to characterize the genetic differentiation among populations (i.e., mountain ranges) as well as any differentiation among subpopulations within mountain ranges. Initially we are examining an approximately 3000-base pair region of the mitochondrial genome that includes the control region, ND6, the tRNAs for threonine, proline, and glutamine, and a portion of cytochrome *b*. Thus far, analysis of twelve individuals from five populations has yielded six haplotypes. This preliminary sequence data suggests strong differentiation between Laguna Mountain birds (*S. p. leuconucha*) and San Gabriel Mountain and more northerly birds (*S. p. melanotis*), while San Bernardino and San Jacinto Mountain birds show intermediate characteristics. Future work will include sequencing additional individuals from twelve sampling locations ($n \geq 6$) across eight populations within the study area, followed by population genetic and phylogeographic analysis of sequence data. This research will provide insight into the evolutionary ecology and natural history of the pygmy nuthatch, especially the degree to which gene flow occurs among populations of such a sedentary species.

58. *E. COLI* AND *ENTEROCOCCUS* IN SURFACE WATERS OF EAST SAN GABRIEL RIVER WATERSHED: LEVELS OF CONTAMINATION IN THREE FLOOD CONTROL CHANNELS AND SAN DIMAS CANYON CREEK

Victor M. Delgado and S. V. Merritt, Biology Dept., University of La Verne, La Verne, CA 91750

Previous studies have indicated that high levels of *Enterococcus spp* bacteria enter Puddingstone Reservoir through influent water (Kocher 2001; Brady; in progress). The purpose of this paper has been to examine further the levels of bacterial contamination in the main watercourses leading into Puddingstone Res. and to identify possible sources of the contamination. Between 3/17/04 & 4/07/04, samples were taken at the mouths of the three flood control channels, which drain the sub-watershed into Puddingstone Res. and from 3 sites upstream of Puddingstone Channel, in San Dimas Canyon Creek, which flows from the Angeles National Forest. Samples were also taken directly from a drainpipe entering San Dimas Canyon Creek. Samples were tested in the University of La Verne labs. Replicate samples were analyzed at 3 Valleys Municipal Water District under the supervision of 3 Valleys lab personnel.

Preliminary results from 4 sample sets showed that, of the three, San Dimas Canyon Puddingstone Channel (SDCP Channel) was the major source of both *E. coli* and *Enterococcus spp* contamination entering Puddingstone Res. during dry periods, within the 5-week sampling timeframe. Following a rain event, however, *E. coli* and *Enterococcus spp* in the other two channels (Marshall Creek and Live Oak) increased to more than 2,410 (MPN) organisms/100mL and 2,000 (NPN) organisms/100mL, respectively—well above EPA standards.

Drainpipe water entering San Dimas Canyon Creek was found to be a major point source for both *E. coli* and *Enterococcus spp* contamination.

59. ASSESSING THE POTENTIAL FOR PALEOCLIMATE STUDIES IN CRYSTAL LAKE, SOUTHERN CALIFORNIA.

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There are very few lake records of past climate change in Southern California. As part of a research initiative to understand better the region's baseline of natural climate variability, a series of lake research projects are being conducted throughout Southern California. One of the study lakes is Crystal Lake.

Crystal Lake is a natural water body located in the San Gabriel Mountains of Southern California. The lake's small drainage basin and direct recharge of water via precipitation runoff, make the lake an ideal setting for recording a history of storm events. Based on this reasoning, several cores were extracted from Crystal Lake in the summer of 2003 to assess the lake's potential for paleoclimate studies.

Total organic matter, total carbonate, mass magnetic susceptibility, and microscopic charcoal counts were measured on two lake sediment cores. In addition, a history of human activity, fire history, and precipitation data were obtained for the Crystal Lake area. Sediment age control was determined by correlating known anthropogenic and fire data with the measured sediment characteristics.

Based on the occurrence of regional fire activity and human development in the lake drainage basin in comparison to the lake's sedimentological properties, we have determined that Crystal Lake sediment does not contain a significant paleoclimate record. Rather, the lake sediments over the past 120 years record a combination of rapid sedimentation events related to human activities (i.e., construction of buildings) and fire occurrence (i.e., reduction in soil stability). Additional studies of longer sediment cores that pre-date human occupation (i.e., 1860 A.D.) are required to better assess the paleoclimate potential of Crystal Lake sediments.

60. SEASONAL BACTERIAL CONCENTRATIONS IN THE LONG BEACH/LOS ANGELES HARBOR COMPLEX

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Non-point source runoff can increase the amount of bacteria in surface and coastal waters. Freshwater outlets such as storm drains are found to be especially high contributors of bacterial contamination. Total and fecal coliform and enterococcal bacteria are used to indicate the likelihood of pathogenic organisms in surface waters. The presence of coliform bacteria indicates potential health risks to users of recreational waters, and enterococcus, specifically, has been shown to cause the stomach flu and other infections. These bacterial concentrations in rivers and coastal waters may be dependent on season, and have been linked to rainfall amounts, especially the first major rainfall of the season (the "first flush"). The amount of total coliforms, fecal coliforms (as estimated by *E. coli*), and enterococcus were tested seasonally and after the first flush at several sites in the LA/Long Beach harbor complex. The results yielded several overlying themes: 1) there is not an overall "seasonal" pattern – more wet vs. dry season pattern; 2) health limits were exceeded for most first flush and fall samples; 3) there were spikes in pathogen input to the harbor at Dominguez channel and the LA River; and 4) most concentrations abated by the time plumes reached the gates of the harbor breakwaters. Bacterial concentrations were also negatively correlated with salinity and positively correlated with turbidity. This pilot

project will serve as a model for an additional 5-year monitoring project of the same area and will provide valuable data on the dynamics of bacterial concentrations in the harbor complex.

61. ISOLATION AND CHARACTERIZATION OF MICROSATELLITE LOCI OF YELLOWFIN GOBY, *ACANTHOGOBIOUS FLAVIMANUS*

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To study the genetic consequences of the invasion of yellowfin goby into San Francisco Bay from East Asia, we have sought development of species-specific microsatellite loci to acquire allele frequency data for analysis. Microsatellite loci are highly informative genetic markers used in population genetic, linkage mapping, and parentage studies of many organisms, including fishes. More plainly, they are simple sequence repeats (SSR's) typically composed of two to four nucleotides such as (GT)_n or (GATA)_n where n is the number of repeats that is typically between 5 and 50. We developed microsatellite loci from total genomic DNA recovered from muscle tissue. The DNA was digested with *SAU3A* 1 to create restriction fragments of 200-400 base pairs used to produce a partial genomic library enriched in microsatellite loci. The critical enrichment step was the ligation of an oligonucleotide "linker" to the restriction fragments. The fragments were then hybridized to a 5'-biotinylated oligonucleotide probe of a repeating motif, ATAGAATAT(CA)₁₅. Hybridized DNA was then sequestered from the solution using magnetic beads. The sequestered fragments were amplified by PCR using the linkers as primers, and were then subcloned into TOPO TA cloning vectors that were used to transform *E. coli*. We screened clones for inserts by restriction enzyme digest, and those with inserts were screened for a microsatellite locus by direct DNA sequencing. We isolated microsatellite loci at rate of 1 out of 10 per clone positive for an insert. Of those clones 3 out of 10 proved to be variable.

62. EFFECTS OF LIGHT AND TEMPERATURE ON PHOTOSYNTHETIC RESPONSES OF THE INVASIVE INTERTIDAL SEAWEED *CAULACANTHUS USTULATUS* (RHODOPHYTA)

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Seaweed invasions appear to be increasing along the southern California coast. The 2002 appearance of the aquarium strain of *Caulerpa taxifolia* has been widely publicized; however, introductions of the Asian kelp *Undaria pinnatifida* and the intertidal red alga *Caulacanthus ustulatus* have received much less attention. Genetic analyses of *C. ustulatus* plants introduced to Brittany, France, indicated a western Pacific origin. Along the Pacific coast of North America, *C. ustulatus* is known to occur in Washington and British Columbia and also in Pacific Mexico. Recent studies performed in our lab revealed that *C. ustulatus* first appeared on southern California shores during the late 1990s. This species is now exhibiting invasive behavior and has become the dominant component of upper mid-shore algal turfs at several southern California sites near harbors and marinas where it grows on rock, articulated coralline algae, rockweeds, mussels, and barnacles. Culture studies of Brittany specimens indicate that *C. ustulatus* can tolerate temperatures of 6 °C to 26 °C, with best growth occurring at 17 °C. To date, however, few scientific studies have been performed on either native or invasive strains of *C. ustulatus*. and little is known about its biology or ecology. Here, we examine the photosynthetic responses of southern Californian specimens of *C. ustulatus* to light and temperature. We report P_{max}, light

saturation, and light-limited slopes (α) for *C. ustulatus* at 11, 14, 17, and 20 °C, a range of temperatures often encountered in southern and central California coastal waters. We compare our results with the published growth responses of *C. ustulatus* from France.

63. THE STATE OF SAN DIEGO BAY IN 1998: ECOLOGICAL CONDITIONS

A.K. Groce, D. Pasko, D.A. Ituarte, E.C. Nestler, R.J. Gartman, T.D. Stebbins, R.N. Haring. City of San Diego Ocean Monitoring Program, San Diego, CA, 92101.

San Diego Bay is an important commercial and military port that harbors several important natural resources. The goals of the present study were to characterize physical, chemical and biological conditions of the Bay, identify long-term ecological trends within the Bay, and to address public concerns about the exposure to contaminants from eating local fishes. Most data were collected during the Southern California Bight (SCB) 1998 Regional Monitoring Project. Components of this survey included assessing sediment quality, macrobenthic communities, trawl-caught fish and invertebrate communities, and contaminant levels in fish tissues. Important results indicated: (1) several metals and PAHs were prevalent in sediments at concentrations exceeding biological impact threshold levels; (2) areas of high sediment contamination were associated with commercial shipyards, naval installations, and small vessel marinas where the percentage of fine sediments was often greatest; (3) hydrodynamic conditions appeared to be the primary factor that influenced the distribution of macrobenthic assemblages in the Bay; (4) contaminant levels in sediments were a secondary factor that appeared to be correlated with assemblage composition (5) metals were less prevalent in fish tissues than in sediments and rarely reached or exceeded human consumption limits; (6) PCBs and DDT were detected in almost all tissue samples; (7) DDT concentrations were below human consumption limits for muscle tissues, but both DDT and PCBs exceeded mammal predator protection limits for whole fish samples.

64. LOSS OF *accD* GENE FROM CHLOROPLAST GENOMES

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Insights from gene loss/transfer events in the chloroplast can be used to infer chloroplast evolution and plant phylogeny. The plant chloroplast gene *accD* appears to have been lost or transferred from the chloroplast genome in modern monocot plants. *AccD* encodes the β subunit of acetyl-CoA carboxylase, the enzyme that catalyzes the first step of fatty acid synthesis. Molecular and bioinformatic methods are being employed to find the point of loss of *accD* from the chloroplast genome. It is within the superorder Commeliniflorae (which contains the grass family) where the point of loss appears to have occurred. I am working on identifying the plant species where *accD* was first lost from the chloroplast genome. Chloroplast-residing *accD* has been found in some members of the family Commelinaceae while being absent in other members. We have identified the presence of *accD* in various members of Commelinaceae and other families in Commeliniflorae.

65. THE EFFECTS OF EXCESS ZINC ON DEVELOPING MURINE THYMOCYTES.

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Zinc is one of several transition and heavy metals that is considered both a micronutrient and a toxicant, depending on its dose. However, excess extracellular zinc has recently been implicated in the modulation of various cellular processes such as the inhibition of cell death, as well as proliferation, secretion, and ion transport. Since cell death, or apoptosis, is a vital step during the selection of developing thymocytes, we investigated whether excess zinc would prevent apoptosis in developing thymocytes. We further investigated how zinc would affect the maturation and differentiation of these thymocytes. We cultured and incubated neonate mouse thymocytes in a range of zinc sulfate concentrations, then analyzed them with flow cytometry to compare frequencies of cell death, as well as ratios of CD4 and CD8 thymocytes. We found that the concentration of extracellular zinc correlated proportionally with resistance to dexamethasone-induced apoptosis in a dose-dependent manner, but only up to naturally toxic concentrations of zinc. We also found that the higher the concentration of zinc that thymocytes were cultured in, the further they progressed, developmentally, from CD4⁺/CD8⁺ (immature) thymocytes, to intermediate CD4⁺/CD8^{weak} (more mature) thymocytes. Since high zinc concentrations are common in the environment, and considering the effects that zinc can have on developing immune cells, we suspect that excess zinc may be contributing to the rise in immune disorders such as asthma and respiratory allergies, as well as cases of lymphatic cancers.

66. SCRIPPS INSTITUTION OF OCEANOGRAPHY BENTHIC INVERTEBRATES COLLECTION.

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The Scripps Institution of Oceanography Benthic Invertebrates Collection houses specimens collected from throughout the world's oceans by Scripps scientists. Collection materials are used to support graduate classes, scientific research, and educational programs at the Birch Aquarium. Published catalogs document Collection holdings of six invertebrate phyla. Material is made available for study to qualified researchers through visits to the Collection or by loan. The Collection is housed in a new building with compactor shelving provided by a grant from the National Science Foundation. A website <<http://collections.ucsd.edu/bi/index.cfm>> provides more extensive information regarding the Collection and downloads of catalogs available in digital format.

67. CLONING OF YEAST ENV GENES RESPONSIBLE FOR LYSOSOMAL PROTEIN TRAFFICKING AT A POST-GOLGI, PRE-VACUOLAR COMPARTMENT

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Recognition, sorting, and localization of lysosomal proteases to the degradative lysosome are vital for the operation of eukaryotic cells. In order to elucidate the steps involved in post-endosomal delivery of soluble hydrolases to the vacuole, we have isolated several *env* mutants of the yeast *Saccharomyces cerevisiae* that internally accumulate p2CPY but have intact secretion. The gene cloning strategy of two *env* genes (*ENV1* and *ENV2*) is conducted by the process of functional complementation. This strategy involves transforming the mutant cells with a yeast

genomic DNA library and assaying for complementation by either a growth defect dependent screening for *ENV1* or colony immunoblotting screening for *ENV2*. A total of seven putative *ENV1* clones have been generated and sequencing confirms that all harbor the ORF containing the vacuolar protein sorting gene *VPS35*, suggesting that *VPS35* is the *ENV1* gene. However, complementation studies involving non-transformed *ENV1* mutants transformed with the genomic library constructs isolated from the putative clones yield mixed results indicating that the *ENV1* gene may not be *VPS35*. The exact relationship between the *VPS35* and *ENV1* genes is currently under investigation. Large scale screening of *ENV2* has yielded two complementing plasmids. The yeast DNA insert of the plasmid was partially sequenced and compared to the yeast gene bank. Putative ORFs were identified and will be checked in order to confirm the minimum complementing sequence by recombinant DNA methods. The characterization of additional selective agents for use in the growth defect-mediated functional complementation cloning of other *ENV* mutants is currently underway.

68. SEDIMENT CONDITIONS WITHIN SAN DIEGO BAY – RESULTS OF BIGHT'98 REGIONAL SURVEY.

Dean Pasko, Daniel A. Ituarte, Eric C. Nestler, **Ami K. Groce**, Timothy D. Stebbins, R. Nicholas Haring. City of San Diego Ocean Monitoring Program, San Diego, CA 92101.

This poster presents summaries and analyses of sediment grain size and chemistry data collected at 46 stations in San Diego Bay in conjunction with the regional Bight'98 survey. The contaminants examined include organic indicators, metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides. The results indicate that the highest levels of pollutants were widely distributed among commercial shipyards, naval installations, and small vessel marinas where the distribution of fine sediments was often the greatest. Stations with the greatest number of contaminants that exceeded recognized sediment screening criteria also tended to have the highest percentage of fine sediments. The potential for fine particles to sorb contaminants, and settle in areas of reduced water flow such as shipyards and marinas, may explain this distribution pattern. Metals and PAHs appear to be in decline within bay sediments when compared to historical levels. Pesticides and PCBs were also found in very low concentrations compared to previous studies; however, these lower detection levels (or lack of detection) may reflect differences in instrumentation or confirmation techniques used by the laboratories that conducted the studies. In addition, sediment conditions in San Diego Bay were compared to those of other bays and harbors sampled during Bight'98. Overall, the results of the 1998 survey of sediment quality conditions suggest that San Diego Bay contained lower concentrations of organic indicators and contaminants than many other Southern California Bight embayments.

69. STRUCTURE OF THE BENTHIC MACROFAUNA IN BAHÍA SANTA ROSALITA, BAJA CALIFORNIA, MÉXICO.

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In July 2001, 10 benthic stations were sampled in Bahía Santa Rosaliita, Baja California, México. Structure and composition of the benthic macrofauna were analyzed. A total of 3829 individuals, representing 234 species were identified. Polychaetous annelids constituted 53% (2,039) of the total macrofauna, followed by crustaceans with 33% (1,279), molluscs 12% (449), and echinoderms 2% (62). The nine most abundant species, contributing 46% of the total macrofauna were *Apoprionospio pygmaea* 13% (501), *Photis brevipes* 6% (232), *Spiophanes bombyx* 6% (231), *Polycirrus* sp A 5% (180), *Synchelidium americanum* 4% (156), *Oxyurostylis pacifica* 3% (114), *Caprella californica* 3% (111), *Tellina modesta* 3% (109), and *Ericthonius brasiliensis* 3% (102). Diversity and abundance of the benthic fauna decreased with increasing depth. Environmental stress defined by rarefaction analysis divided to the bay in two zones: (ZI) average stress, located at shallow stations; and low stress (ZII) located for rest of the bay. Analysis of classification and ordination based on a Bray-Curtis similarity and non-metric multidimensional scaling (N-MDS) separated the area of study in two groups of stations defined by depth, organic carbon and percentage of medium to fine sand.

70. MALE MORPHOLOGY AND CALLING SONG CHARACTERISTICS IN THE FIELD CRICKET, *GRYLLUS BIMACULATUS*

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Male field crickets produce calling songs to attract females. The characteristics of these songs may convey information regarding the species identity and phenotypic characteristics of the male. We examined how male morphological characteristics were correlated with calling song characteristics in *Gryllus bimaculatus*. We recorded the songs of individual males and measured the chirp rate, chirp duration, pulse duration, pulse carrier frequency and the degree of frequency modulation within a single pulse. We also measured morphological characteristics (e.g. pronotum width, tibia length,) of these males. Fluctuating asymmetry, a presumed measure of developmental stability or genetic quality, was estimated as the difference in tibia length between the right and left side. Song characteristics varied among individuals and there was a significant degree of frequency modulation. Pronotum width (an estimate of body size) was negatively with correlated carrier frequency and positively correlated with chirp rate. However, other morphological characteristics were not correlated with male calling song characteristics. These results demonstrate that calling song can convey information regarding male size but not fluctuating asymmetry.

71. MOLECULAR EVOLUTION OF THE CHALCONE SYNTHASE GENE FAMILY IN *DUBAUTIA LINAERIS* (HAWAIIAN SILVERSWORD)

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The silversword alliance of plants in the Hawaiian Islands, an exceptional model of adaptive radiation, evolved to become the twenty-eight silversword species seen today. Chalcone synthase (CHS) is the first committed enzyme in the anthocyanin pathway responsible for flower color and other phenotypes important in reproductive success. Because of the phenotypic advantage of color we are probably looking at key loci which can give insight into the radiation event.

I have isolated portions of the CHS genes from *Dubautia linaeris*. Optimization of reverse PCR is being implemented to extract the entire gene. Using other silversword and tarweed plants or DNA from other institutions I hope to sequence *CHS* in them as well. This can help predict the times of divergence of the species, their relationships, and shed light on evolution in this gene family and thus contribute knowledge to help in conservation efforts of this unique group of endangered/threatened plants.

72. PHYLOGEOGRAPHY OF *NORRISIA NORRISI* IN THE SOUTHERN CALIFORNIA BIGHT, WITH AN EMPHASIS ON GENETIC VARIATION BETWEEN DISTURBED AND UNDISTURBED HABITATS.

Michelle Stabio, California State University, Los Angeles

A phylogeographic study was conducted on the Norris' Top Snail, *Norrisia norrisi* (Archaeogastropoda: Trochidae) to assess if: (1) the species consisted of a single, large panmictic population within the Southern California Bight (SCB), (2) larval dispersal was affected by ocean current patterns, and (3) genetic diversity was negatively affected by habitat disturbance. Specimens of *N. norrisi* were collected from nine different locations within the SCB. In a 557 bp fragment of the Cytochrome Oxidase subunit I mitochondrial DNA gene, 28 sites were polymorphic resulting in 24 haplotypes. A single haplotype was found in 53 of the 76 individuals and was the dominant type in all geographic locations. The sequence data were used to generate a haplotype network and calculate haplotype and nucleotide diversity statistics. The results showed a moderate to low haplotype diversity coupled with low nucleotide diversity, which suggested the occurrence of a recent population bottleneck. No clear connection was made between ocean current patterns and larval dispersal. Collection sites with high levels of arsenic and mercury were found to have significantly lower haplotype diversity than areas without high levels of these contaminants.

73. MOLECULAR ANALYSIS OF GENETIC VARIATION IN THE FEDERALLY ENDANGERED *ASTRAGALUS JAEGERIANUS* (FABACEAE, PAPILIONOIDEAE): A SPECIES WITH A RESTRICTED GEOGRAPHIC RANGE

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Analysis of genetic variation and population structure is being conducted on the federally endangered Lane Mountain milk vetch (*Astragalus jaegerianus*), a species with a geographic restricted range (approximately 35 km²) within the Mojave Desert of southern California. Species with geographically restricted ranges often exhibit low levels of genetic variation, which puts them at risk of extinction or local extirpation. Conversely, species with limited ranges and geographically distinct populations can often be partitioned into genetically distinct populations. Five geographically distinct populations for *A. jaegerianus* have been delineated with 20 individuals sampled from each population. Five nuclear and chloroplast markers (nrDNA ITS 1-5.8S-ITS-2 cistron, and cpDNA trnL intron and trnL-F intergenic spacer) with known utility for phylogenetic and phylogeographic studies, have been sequenced for a subset of the plant samples from each population. Thus far, our data shows no single nucleotide substitutions or indels within the sequences (monomorphism), which suggests a low effective population size for the species. Additional work includes sequencing the DNA markers for the remaining plant samples for each population, and using AFLP technology on all plant samples to screen a larger portion of

the genome for genetic variation. Effective conservation strategies for geographically restricted species require the assessment of genetic variation within and among populations. Such quantification is needed to reliably estimate numbers of individuals and populations needed for the long-term conservation of the species.

74. THE ROLE OF PLANT-SOIL FEEDBACKS IN COASTAL SAGE SCRUB RESTORATION ON SANTA CRUZ ISLAND, CA.

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Plants have the ability to alter soil properties, such as nutrient pools via litter inputs, which may then feedback to alter plant performance and competitive outcomes between native and invasive species. The role of plant-soil feedbacks in influencing the reestablishment of the native shrub *Eriogonum arborescens* (Island Buckwheat) into alien annual grassland was investigated on Santa Cruz Island, CA. Through the Central Valley of Santa Cruz Island, mature stands of *E. arborescens* and *Artemisia californica* (sagebrush) dominate on shallow, rocky soils without grasses. In between areas dominated by shrubs or grasses, a mixed zone occurs, where native shrubs have begun to colonize the grassland. Transects were established through the transition zones to document relative percent cover of shrub and grass and plant size-class structure. Soil samples were obtained from underneath *E. arborescens* in the shrub only zone and mixed zone and underneath *Avena fatua* (Wild Oats) in the mixed zone and grass only zone. Soils were then tested for field moisture, water holding capacity, available nitrogen (NO_3^- and NH_4^+), organic matter content, N mineralization, and CO_2 respiration. If shrubs have the ability to alter soils as they establish, then soil characteristics under establishing shrubs (in the mixed zone) should differ from grass soils and more closely resemble soils in established shrub areas (shrub only zone). This, however, was not the case for any soil variable tested. Therefore, plant-soil feedbacks, in terms of nitrogen cycling, will not play a large role in native reestablishment efforts.

75. THE EFFECT OF SUBSTRATE SALINITY ON THE GROWTH OF *SALICORNIA VIRGINICA* L.

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Salicornia virginica, the dominant species in the Ballona Wetlands, is associated with relatively high substrate salinities in the field but a lack of response to elevated atmospheric CO_2 levels by plants grown at substrate salinities above 20 ‰ suggests that the physiological optimum may be lower. To determine the optimum substrate salinity for growth, rooted cuttings (Accession #: Co203-15, Tree of Life) were grown in quartz sand cultures and irrigated with 0, 5, 12.5, 20, 27.5, 35, or 40 ‰ NaCl. Additionally, as *S. virginica* is subjected to fluctuating salinities from tidal action, fresh water blending, and the high-winter, low-summer rainfall characteristic of the southern California climate, two fluctuating salinity treatments that averaged 20 ‰ (by weekly alternations of 0 ‰ and 40 ‰ or 12.5 ‰ and 27.5 ‰) were applied. Although biomass was greatest at 5 ‰ NaCl, *S. virginica* was tolerant of a broad range of salinities and significant decreases in biomass only occurred above 20 ‰ NaCl. Also fluctuating salinities did not alter growth by comparison to a constant 20 ‰. In the absence of NaCl, biomass, succulence, and branching were considerably reduced. Thus *S. virginica* shows salt-stimulated growth and tolerates broad and fluctuating substrate salinities.

76. PHYLOGEOGRAPHY AND PATTERNS OF GENETIC DIFFERENTIATION IN THE WESTERN FENCE LIZARD, *SCELOPORUS OCCIDENTALIS*, IN SOUTHERN CALIFORNIA

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Southern California is an area of high levels of faunal diversity and has exhibited a complex history of climatic and geomorphological change associated with this diversity. Certain species have broad distribution patterns in the western U.S. (including southern California) with only low to moderate levels of morphological differentiation that do not appear to reflect the complexity of faunal diversity or geological history in southern California. The western fence lizard (WFL) is one such species that is distributed from northern Baja California to Washington State and east to western Utah. Within southern California, one named subspecies is distributed across most of the region with separate subspecies found on the Channel Islands and along the coast from Ventura north. We have carried out a study to investigate the general pattern of genetic differentiation in the WFL and to determine if the named subspecies are identifiable genetically. We collected lizards from over 70 populations in southern California and sequenced approximately 900bp of the NADH-4-Leucine region of the mitochondrial DNA. A phylogenetic analysis of these sequences indicates that there are four major lineages or clades present in the region with over 6% sequence difference between haplotypes from different clades and over 4% difference between haplotypes within clades. Each of these clades is isolated geographically with relatively narrow boundaries between them. Except for the Channel Island subspecies, the pattern of genetic differentiation does not correspond to the named subspecies, but the degree of differentiation observed indicates that this species has been present in southern California for over 2 million years and the complexity is comparable to other southern California species groups.

77. MOLECULAR ECOLOGY OF A RIPARIAN AMPHIBIAN IN SOUTHERN CALIFORNIA: THE CALIFORNIA TREEFROG (*Pseudacris cadaverina*)

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The California treefrog (*Pseudacris cadaverina*) is a stream-dwelling amphibian found in southern California and northern Baja California, Mexico. The habitat of *P. cadaverina* is confined to rocky streams. Because it requires perennial water, this species is geographically restricted throughout much of its range. In this study, DNA sequence data is being used to determine the nature and extent of phylogeographic structure among *P. cadaverina* populations in southern California. Of particular interest is how barriers to dispersal—such as watershed boundaries, deserts, and mountains—may have influenced this structure. Specimens have been collected from 38 localities spanning the species' range in southern California, including coastal and desert watersheds. Thus far, 1147 bp of mitochondrial cytochrome b sequence data from 34 individuals have yielded 20 haplotypes across 13 populations. The mean sequence divergence within *P. cadaverina* is about 1.1%. *P. regilla* was used as an outgroup in phylogenetic analyses. Several geographically associated clades within *P. cadaverina* are supported by preliminary phylogenetic analyses and suggest broad divisions between coastal and desert populations. Further work will involve collecting cytochrome b sequence data from individuals representing additional populations across southern California as well as generating amplified fragment length polymorphism (AFLP) data. The conclusions of this study will shed light on the evolution and population genetics of *P. cadaverina* as well as provide information on the genetic connectivity

of watersheds in southern California. Such information will be useful to conservation efforts in the region.

78. NUCLEAR GENE FLOW IN AREAS OF PRESUMED SECONDARY CONTACT IN THE WESTERN FENCE LIZARD, *SCELOPORUS OCCIDENTALIS* IN THE SAN GABRIEL MOUNTAINS OF SOUTHERN CALIFORNIA

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Previous research indicated the presence of 12 mitochondrially distinct clade groups that are distributed throughout the California range of the western fence lizard. Presumably, the geographic assortment of the clade groups of these lizards indicates isolation and secondary contact among clade groups. However, areas of introgression appear to be limited, and the conduction of respective mitochondrial DNA appears to be restricted to narrow bands (~12km) between populations that are fixed for particular clade memberships. To investigate the nature of the observed barriers to mitochondrial gene flow, 6 nuclear DNA microsatellite markers were scored in 22 populations of lizards. These populations included some that were fixed for a northern clade group, some that were fixed for a southern clade group, and some that were intermediate in clade group ratios. AMOVA indicated molecular structure among the populations, and pairwise F_{ST} 's revealed that the primary differences in allele frequencies did not reflect differences in mitochondrial clade group frequency. In fact, the allele frequency differences occurred between a group composed of 4 populations found on the northern slope of the San Gabriel Mountains. While the 4 populations showed great differences with nearly all other populations, no significant tests were found among them. Interestingly, these four populations represented all three aforementioned clade group characteristics. This pattern indicates that these four desert-adapted populations were subject to gene flow among them, with complete disregard to the mitochondrial barriers. These four are now assumed contain nuclear DNA that was adapted to survival in the desert environment.

79. ECOLOGICAL GENETICS OF THE TIDEPPOOL COPEPOD *TIGRIOPUS CALIFORNICUS*

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Despite a seemingly high potential for dispersal, populations of the tidepool copepod *Tigriopus californicus* show extreme molecular differentiation over short geographic distances. For example, populations only 10 km apart can have up to 17% divergence in mitochondrial DNA. Two lines of evidence suggest that this high level of molecular differentiation is accompanied by relatively low levels of adaptive differentiation. First, fitness measurements under common garden conditions show significant effects of environment (temperature and salinity effects), but no significant population x environment interactions. Second, molecular population subdivision for 5 microsatellite markers was found to be considerable higher than quantitative trait subdivision for life history and morphometric characters ($F_{ST} = 0.80$, $Q_{ST} = 0.30$). The unusual pattern in *T. californicus* might be attributed to either restricted quantitative trait evolution or enhanced molecular evolution, both of which may be related to the harsh and variable physical conditions of the high intertidal habitat.

80. CONTRASTING DISPERSAL IN TWO CALIFORNIA ABALONE SPECIES USING A POPULATION GENETIC APPROACH

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Data from drifters released in the Santa Barbara Channel and Santa Maria Basin off southern California reveal local eddies and long-range currents that may retain abalone larvae or transport them great distances depending upon location along the coast and season. The red abalone *Haliotis rufescens* which spawns year-round in southern California and October through February in northern California, exhibits high genetic connectivity along nearly 1000 kilometers of coastline and may take advantage of multiple ocean current regimes that occur throughout the year, providing populations with both local recruitment (summer) and pulses of recruits from distant sources (winter). In contrast, the black abalone *H. cracherodii*, which spawns in late spring and summer when flow patterns display coastal eddying and jets of upwelling that may cause the retention or offshore movement of larvae, exhibits some restriction in gene flow along the Central Coast of California.

81. DIVERSITY, HISTORY, AND PHYLOGEOGRAPHY OF THE NORTHEASTERN PACIFIC COAST

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A significant component of marine diversity along the western coast of North America appears to have radiated in the Late Miocene and, in some cases, secondarily in the Pleistocene. Molecular and paleontological data document that the timing of these radiations is coincident with peaks of upwelling on the West Coast. Whereas perturbations in upwelling limited the diversity along other temperate western margins, several factors might have helped sustain diversity in the northeastern Pacific. These include continuity of upwelling, silica-rich subthermocline waters, and the trophic structure of the region's kelp forests. We suggest that much of the West-Coast diversity appears to be a relict of earlier upwelling regimes. Modern phylogeographic barriers along our coast also appear to be the product of geologic and climatic events of the Mio-Pliocene, Plio-Pleistocene, and Pleistocene-Holocene transitions. In the context of such events, we discuss phylogenetic patterns observed for variety of ecologically important taxa; e.g., kelp, alcid birds, salmon, rockfish, abalone and cancrid crabs.

82. STOCK STRUCTURE ANALYSES OF SPOTTED DOLPHINS IN THE EASTERN TROPICAL PACIFIC OCEAN REVEAL A HIGH DEGREE OF FEMALE PHILOPATRY

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Mitochondrial DNA (mtDNA) control region sequences and microsatellite loci length polymorphisms were used to investigate genetic differentiation in spotted dolphins (*Stenella attenuata*) in the Eastern Tropical Pacific and to examine the intraspecific structure of the coastal subspecies (*S. a. graffmani*). One hundred and thirty five animals from several coastal areas and 90 offshore animals were sequenced for 455 bp of the mitochondrial control region, resulting in 112 mtDNA haplotypes. Phylogenetic analyses and the existence of shared haplotypes between

the two subspecies suggest recent and/or current gene flow. Analyses using χ^2 , F_{ST} values (based on haplotype frequencies) and Φ_{ST} values (based on frequencies and genetic distances between haplotypes) yielded statistically significant separation (bootstrap values $P < 0.05$) among five different coastal and the offshore strata. Samples were also genotyped for seven microsatellite loci. Again, F_{ST} indexes resulted in significant subdivision between offshore and coastal animals, but no population structure was detected within the coastal strata. This difference between the levels of genetic structure uncovered by mitochondrial and nuclear markers suggests the existence of male-biased dispersal, with females being highly philopatric. These results argue for the existence of at least five distinct coastal populations, which should be treated as separate units for management purposes and suggest the existence of male-biased dispersal among the coastal strata.

83. THE EFFECTS OF DISPERSAL AND HABITAT PREFERENCES ON SPECIATION IN CARIBBEAN MARINE OSTRACODES

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The cypridinid ostracode crustacean *Skogsbergia leneri* is considered a widespread but monotypic marine species of the Caribbean. Previously, morphological variation had been noted among *S. leneri* populations from different Caribbean localities. We sequenced 450 bp of the 16S rDNA mitochondrial gene from a total of 142 individuals from multiple habitats (reef, grassbed, mangrove, and sand) from the Florida Keys, Jamaica, Puerto Rico, US Virgin Islands, Mexico, Belize, and Panama. A total of 76 haplotypes were identified. Phylogenetic analysis revealed 6 major clades of haplotypes, each of which may contain multiple species. Although morphologically similar, the major clades within *S. leneri* were as divergent in the 16S rDNA region (11-19% sequence divergence) as are genera of luminescent ostracodes from the same family. Haplotype diversity was high within habitats, but sequence divergence among haplotypes within habitats was low. Haplotypes were rarely shared among adjacent habitats or between localities, suggesting limited dispersal or reproductive isolation as a result of adult habitat preferences. Molecular evidence suggests that *S. leneri*, as currently defined, consists of multiple species in the Caribbean.

84. APPLICATION OF BEAD ARRAY TECHNOLOGY TO COMMUNITY DYNAMICS OF MARINE PHYTOPLANKTON

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Studies of the dynamics of marine microplanktonic systems have been hampered by a lack of high throughput technologies for the simultaneous identification and quantification of the many taxa comprising such communities. To begin to address this problem, we developed a DNA-hybridization based method of analysis employing bead array technology. Species and/or genus specific probes for eight phytoplankton taxa were designed and applied to the microplankton community sampled from coastal waters in La Jolla, California over an exploratory time series 10 days in length. Bulk DNA extractions from 1 liter of seawater were used without PCR amplification. Taxa analyzed included four dinoflagellates, three diatoms, and one coccolithophorid. Results demonstrated that specifically targeted oligonucleotide probes can be

used in this fashion with a high degree of binding specificity, dependent on hybridization temperature, and that standard curves relative to target cell concentration can be constructed. Use of two different probes for each taxon can provide added confidence that probes are taxon-specific. Further, single species assays and multiplexed assays were generally in good agreement, as were assays of replicate seawater samples. Once sets of probes are developed for particular groups of taxa, the bead array system appears to provide a technological platform with great promise for high throughput analyses of microplanktonic communities.

**84a GENETIC DIFFERENTIATION OF THE BIOLUMINESCENT MARINE FISH
PORICHTHYS NOTATATUS (BATRACHOIDIDAE)**

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Porichthys notatus is a species of toadfish that occurs along the Pacific Coast of North America from Baja California to Canada. *P. notatus* has hundreds of bioluminescent photophores on its ventral surface which collectively function as a counterillumination mechanism to avoid predation. *P. notatus* in the northern part of the range do not bioluminescence, apparently due to a lack of an available dietary source of the bioluminescence substrate luciferin. The objective of my research was to determine whether there is gene flow occurring between the luminescent and non-luminescent populations of *P. notatus*. Mitochondrial sequences from the 12S rRNA, cytochrome b, and COI genes were used to compare several individuals of *P. notatus* from multiple localities throughout its range. Little to no intraspecific variation was observed in the sequences obtained from 12SrRNA. No differences were observed in the fragment targeted with cyt b primers among the various localities. Intraspecific variability was observed in the COI gene, but the resulting tree demonstrates no phylogeographic structure. However, Fst and Nm values suggest differentiation among populations.

**85. WHAT MTDNA TELLS US ABOUT THE INAVSION HISTORY OF
YELLOWFIN GOBY IN CALIFORNIA-PART I.: THROUGH THE BOTTLE'S
NECK?**

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Yellowfin goby, an estuarine fish native to eastern Asia, was reported in the 1960s to have invaded San Francisco Bay (SFB) via commercial shipping, and then dramatically increased in population size. Did a population genetic bottleneck accompany the invasion? Transient loss of haplotype diversity (h) can accompany population increases following a bottleneck. Although evidence of the loss can persist for some time afterward, h is difficult to interpret in that respect. A least-squares regression analysis of published sequence data from large populations of marine fishes presumably at mutation-drift equilibrium showed that singleton (single copy) mtDNA haplotypes occurred in constant proportion to the numbers of distinct haplotypes discovered. Finding significantly fewer singletons among California yellowfin than predicted from the regression could confirm any transitory loss of (mtDNA) alleles. We compared our singleton-count approach with h using mtDNA control region sequence data from yellowfin goby from SFB, two southern California estuaries (SC), and Honshu Island, Japan (HIJ). The singleton count

for SFB was significantly lower than predicted from the regression ($t = 4.13$, $P < 0.001$), but was not for SC and HIJ; however, h remained high in SFB and HIJ. The evident loss of rare haplotypes from the SFB population is concordant with a recent bottleneck, but how recent is a question. Comparison of the mismatch distributions of SFB and HIJ sequences show that both populations have undergone expansion, but the estimated age of the expansion pre-dates introduction to the California coast.

86. WHAT MTDNA TELLS US ABOUT THE INVASION HISTORY OF YELLOWFIN GOBY IN CALIFORNIA—PART II: HOW MANY INVASIONS?

M.E. Neilson and R.R. Wilson, Jr., California State University, Long Beach, Department of Biological Sciences, Long Beach, CA 90840

Yellowfin goby, *Acanthogobius flavimanus*, a fish native to the estuaries of Japan, Korea, and northeastern China, was first reported in San Francisco Bay (SFB) in the 1960s and is now established there. It appeared in southern California (SC) at LA Harbor in the early 1970s and has since spread to Upper Newport Bay and to south San Diego Bay, as well as to other estuaries between those two locations. Also in the 1970s it was first reported in the estuaries of New South Wales, Australia then later spread south to Port Phillip Bay in Victoria. Regarding the SC expansion we asked: Did yellowfin goby arrive to southern California from SFB or directly from Asia? Population genetic analysis using AMOVA of more than 200 mtDNA control region sequences of fish collected in two consecutive years from SFB and SC, and in a single year from Honshu Island, Japan (HIJ), found highly significant F_{st} and Φ_{st} values among all pairwise comparisons. The two commonest haplotypes in SC were altogether absent from among specimens of SFB. Genealogical analysis of the sequences using TCS found that nearly all of the haplotypes from SFB had derived from a single haplotype from HIJ. The same was true for six haplotypes from SC, but where four SC haplotypes had derived from one haplotype of SFB. Yellowfin goby of northern and southern California appear to have chiefly resulted from separate, possibly one-time invasions from Asia, but where SC might also have previously received some immigration from SFB.

87. MICROSATELLITE ALLELE FREQUENCY ANALYSIS OF *ACANTHOGOBIUS FLAVIMANUS*: EVIDENCE FOR POSSIBLE GENE FLOW BETWEEN SAN FRANCISCO BAY AND TOKYO BAY.

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Yellowfin goby, *Acanthogobius flavimanus*, is an estuarine fish with a native distribution in eastern Asia. New populations of *A. flavimanus* now occur in San Francisco Bay (SFB) and harbors and estuaries of southern California. These new populations may consist of the offspring of a single founder event, where the population size has increased to detectable levels within the last 40 years, or they may be due to episodic transfer of individuals from the native range. Microsatellite allele frequency data from two polymorphic loci were used to evaluate relatedness between populations in SFB (winters of 2001-2003), Upper Newport Bay (spring 2003), Tokyo Bay (summer 2003), and the east coast of Japan (summer 2003). F_{st} values showed no significant difference between populations on the east coast of Japan, consecutive sampling years of the SFB population, the Tokyo Bay and SFB population sampled in years one and two, or between upper Newport Bay and SFB population sampled in year two. Microsatellite allele frequency data from three polymorphic loci were also used to test for a recent population-genetic bottleneck in SFB sampled in year one by comparing heterozygosities expected from Hardy-Weinberg equilibrium

(H_e) with those expected for populations at mutation-drift equilibrium (H_{eq}), according to two models. The number of loci with apparent heterozygosity excess was not higher than expectation for a population at mutation-drift equilibrium; although, the minimum number of loci that should be so evaluated is three. Our results suggest contemporaneous gene flow between yellowfin goby of Tokyo Bay and San Francisco Bay.

88. INTRODUCTION TO THE SYMPOSIUM – ITS PURPOSE AND PLAN.

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Catch & release regulations for both recreational and commercial fishing, mandated by state and federal agencies, are intended to protect both marine and freshwater fisheries. Do they? In this symposium, experts from around the United States and region focused their attention on the biological impacts of fishing-induced stress, as well as stress derived from other sources such as long-term captivity or pollution. What is presently known about the secondary impacts of stress responses was emphasized, particularly how induced stress factors (especially hormones) impact important aspects of physiology and behavior. The potential meaning of scientific findings to fish, fisheries, and fisheries management was also considered. The flow of the symposium was as follows. Stress –specifically stress responses– was introduced as a vertebrate phenomenon that is highly conserved and relevant in fish. The discussion then moved into fish and field, with a variety of research findings on fish presented, and ended with a more management-oriented perspective. At the conclusion of the symposium, an open forum afforded the opportunity for interested participants to provide input and to contribute to a discussion on the overall conclusions taken from the speakers, on future questions and issues in need of attention, and on possible management recommendations. For details on these discussions, we encourage you to go to www.csulb.edu/web/labs/sheephead.

89. THE FISH CASE-STUDY OF THE VERTEBRATE STRESS RESPONSE AND ITS RELEVANCE TO HUMAN-DERIVED IMPACTS IN MARINE FISHES

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Corticosteroid hormones (cortisol, corticosterone) play highly conserved roles among vertebrates as “stress hormones”. These steroids (fish produce cortisol) mediate a variety of physiological changes that are generally adaptive for successful short-term responses to stressors, including mobilization of fuels to support greater energy utilization by muscle and other tissues, and reduction of energy-expensive processes including growth, reproduction, and immune function. Long-term stress responses (more than several days), on the other hand, become significantly maladaptive, as inhibition of the latter physiological processes cannot be prolonged without serious consequences to well-being and survival. Upon encountering a stressor from the environment, such as catching-&-releasing or exposure to an abnormal environment (e.g., contamination, captivity, human activities), fish typically exhibit a rapid (<1 min) but transient elevation in circulating levels of epinephrine (adrenalin) which is followed by a prolonged surge in plasma cortisol levels (initiated within several minutes). The cortisol surge is often profound

(>50-fold in most fish) and will be sustained so long as the stressor remains; once the stressor is removed, cortisol returns toward baseline levels at a rate that differs among species. Importantly, the cortisol surge sets into motion other changes, among them alterations in endocrine regulators of tissue growth & repair. Studies done in our laboratory and in some others have demonstrated that an insulin-like growth factor-binding protein (IGFBP) is increased by cortisol and in several physiological conditions when cortisol is elevated and growth is inhibited. The highly consistent presence of this IGFBP in growth-inhibited fish has led to the proposal that it serves effectively as a biomarker for the growth impacts of stress. Interestingly, we have seen that the IGFBP remains elevated in plasma of stressor-exposed fish even after the surge in cortisol has subsided, suggesting that the physiological impacts of cortisol in fish outlast the initial stress-induced surge in cortisol. Thus, the secondary effects of stress (e.g., on growth) are likely to be of significant importance when considering the greater biological impacts of catch-&-release or other human-derived stressors. [Funded by CA Sea Grant College Prog. NOAA NA06RG042 2002-03, proj. # R/F-192, & NSF grant IBN0115975.]

90. REGULATION OF STRESS STEROIDS IN MAMMALS AND FISH: COMMON MECHANISMS AND DIFFERENCES.

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A key hormone in the response to stress in vertebrates, from humans to fish, is the steroid cortisol, a glucocorticoid. This steroid acts by binding to a receptor, which undergoes a conformational change leading to binding of the cortisol-receptor complex to DNA and the regulation of transcription of genes involved in the glucocorticoid response. These responses include increased glucose metabolism – hence the name glucocorticoid- as well as suppression of the immune response, loss of calcium from bones and programmed cell death, apoptosis, and several other changes. For a long time, the glucocorticoid receptor (GR) was the main focus of research on the stress response. However, it is now clear that enzymes that regulate the concentration of cortisol that can reach the GR also are important in the stress response. One of these enzymes, 11 β -hydroxysteroid dehydrogenase-type 2 (11 β -HSD-2) catalyzes the oxidation of the C11-hydroxyl on cortisol to a ketone, yielding cortisone, an inactive steroid. This is a convenient on-off switch that conserves the steroid and allows it to be used. The recent cloning of 11 β -HSD-2 from fish provides new insights into the regulation of cortisol levels in fish. Interestingly, 11 β -HSD-2 also converts 11 β -hydroxytestosterone to 11keto-testosterone, the active androgen in fish. Thus, 11 β -HSD-2 is a key regulator of androgen and cortisol action in fish. Environmental chemicals that inhibit 11 β -HSD-2 will have profound disruptive effects on endocrine physiology in fish.

91. CATCH-AND-RELEASE STRESS: IMPACTS ON THE ENDOCRINE PHYSIOLOGY OF THE CALIFORNIA SHEEPHEAD, *SEMICOSSYPHUS PULCHER*

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A catch-and-release policy was implemented several years ago by the state of California for undersized (≤ 30.5 cm TL) California sheephead, *Semicossyphus pulcher*, with the objective of

reducing impacts of fishing pressures on this economically important species. It has not yet been established, however, whether the stress associated with catching and releasing has subsequent maladaptive effects. The impacts of catch-associated stressors on the endocrine physiology of *S. pulcher* were therefore examined, with an emphasis on how metabolism and growth may be altered. *S. pulcher* were caught offshore near Catalina Island using standard hook and line or commercial trapping. Controls (baseline) consisted of fish blood-sampled within 3 min of initial disturbance, which included catching and rapid retrieval to the surface as well as catching directly underwater while diving. Fish were subjected to the following stress-inducing protocols: 1) increasing angling fight times up to 20 min, 2) line-catching and confinement in tanks for 10 min to 30 d, 4) trap-catching with up to 5 h soak times, and 5) catching, releasing to the environment for varying periods, and then sampling of recaptured fish. In all experiments, plasma cortisol concentrations increased significantly and often dramatically in response to catch-associated experiences, in a manner commensurate with the time and intensity of the treatments. Following the elevations in cortisol were sustained increases in plasma glucose, while increases in lactate were more transitory. Plasma levels of a putative growth-inhibitory protein (IGFBP) were increased in stressed fish, along with alterations in IGF-I concentrations, yet no differences in plasma IGF bioactivity were detected in these experiments. Our data thus far indicate that captured *S. pulcher* experiences a profound stress response with associated metabolic impacts, while effects on growth regulatory factors are complex and not yet understood. [Support by CA Sea Grant College Program NOAA NA06RG042 2002-03, project # R/F-192 and NSF grant IBN-0115975]

92. PARASITES OF FISHES ASSOCIATED WITH WASTEWATER DISCHARGE AND THE POTENTIAL OF INFESTATION AND STRESS ON HOST FISHES.

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During the Southern California Bight 2003 Regional Marine Monitoring Survey, select demersal fishes were collected and inspected for ectoparasites. While it is widely known that the southern California marine environment has been subjected to numerous inputs of pollution, such as wastewater effluent, storm runoff, DDTs and PCBs, little is known about the effects of pollution on infestation of parasites on marine fishes. Exposure to pollution may result in stress, which may potentially decrease the immune response in fishes and increase their susceptibility to diseases and parasites. This study evaluates the conditions around wastewater outfalls in terms of infestation (e.g., prevalence and mean intensity) of ectoparasites on demersal fishes and examines if specific parasite and/or host species can be used as bioindicators of environmental stress in the Southern California Bight. A variety of marine organisms have been evaluated as potential biological indicators of various forms of pollution in the aquatic environment. However, due to the range of contaminants to which marine organisms are exposed, it is unclear which organisms and which anomalies are best used as indicators. The hornyhead turbot, *Pleuronichthys verticalis*, has been used as a model organism for indicating environmental stress. Levels of the stress hormone cortisol and infestation levels of ectoparasites were compared in groups of fish collected at various predetermined stations in the Southern California Bight. Preliminary results suggest an abnormal response in cortisol levels in groups of fish with high parasite prevalence.

93. ALTERED ENDOCRINE PHYSIOLOGY OF SOUTHERN CALIFORNIA FLATFISH COLLECTED NEAR WASTEWATER TREATMENT PLANT (WWTP) OUTFLOW - STRESS AND GROWTH.

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Connections between environmental contamination and impairment of endocrine mechanisms regulating stress responses and growth in marine fish are not understood. Our studies are beginning to identify potential alterations in the endocrine physiology of local flatfish captured near the WWTP outflow of the Orange County Sanitation District (OCSD). Hornyhead turbot, *Pleuronichthys verticalis*, and English sole, *Parophrys vetulus*, are emphasized in these studies, as these species are typically present at depths and locations where the outflow pipes exist, thereby increasing their potential to be exposed to contaminants associated with effluents. Fish were caught by trawling at sites immediately proximal to the outflow and compared with fish caught at sites at varying distances therefrom. In comparison with fish from outside locations, individuals sampled near the outflow exhibited an impaired stress response, as they exhibited significantly blunted plasma cortisol surges in response to trawling and handling stressors. In addition, fish from the outflow locations have significantly reduced plasma concentrations of the growth-stimulatory hormone, insulin-like growth factor-I (IGF-I). The connections between cortisol, IGF-I, growth, and contaminants will be discussed. In conclusion, our data suggest that essential endocrine systems, namely those regulating the ability to respond to stress and regulating growth and anabolism, are significantly impaired in fish putatively exposed to WWTP effluents. [Supported by NSF grant IBN-0115975 & CA Sea Grant College Program NOAA NA06RG042 2002-03, project # R/F-192]

94. INTEGRATING PHYSIOLOGICAL AND BEHAVIORAL RESPONSES OF CALIFORNIA SHEEPHEAD EXPOSED TO FISHING-RELATED STRESSORS AND ITS IMPLICATIONS TOWARDS MANAGEMENT.

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Many sport and commercial fisheries require release of undersized fish. However, often little is known about post-release survivorship or non-lethal effects on physiology and behavior. We compared the physiological and behavioral responses of California sheephead (*Semicossyphus pulcher*) caught on hook & line or traps. Small blood samples were taken from each fish exposed to different fishery methods to measure the level of cortisol (stress hormone) and metabolites (glucose and lactate). Behavioral effects were determined by monitoring the rate of movement and area use using acoustic telemetry. Fish caught via either method and rapidly blood sampled (< 3 min) showed basal levels of cortisol and metabolites. However, fish exposed to standard hook & line angling techniques showed time-dependent increases in these parameters, which were greater than those caught in traps. Fish that were caught on hook & line and then tagged with acoustic transmitters showed slower rates of movement and they covered less area in the first 6 hrs after release, as compared with than fish fed transmitters underwater. These results suggest that sport angling of sheephead induces stress-associated alterations in both physiological

and behavioral parameters. However, fish released after stressful angling and trapping events may begin to recover from the physiological and behavioral alterations within 24 hrs. Results indicate that both fisheries induce similar, but differing magnitudes of physiological stress, yet longer-term post-release survivorship is high. [Support by CA Sea Grant College Program NOAA NA06RG042 2001-02, project # R/F-192].

95. GROWTH AND SURVIVAL IN JUVENILE WHITE SEABASS CAUGHT-AND-RELEASED ON OFFSET CIRCLE AND J-TYPE HOOKS

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The catch rate of juvenile white seabass *Atractoscion nobilis* has recently increased following an apparent increase in recruitment throughout Southern California, yet no information is available on the incidental hooking mortality of sub-legal (<711 mm) fish following catch-and-release. We captured juvenile white seabass (430-577 mm total length [TL]) from a net pen on 4/0 offset circle hooks (n = 113), 4/0 J-type hooks (n = 108), and with a net (control, n = 30) to investigate fish performance following release. The effects of hook type on the location of hook penetration, and how hook location affected growth and mortality were examined over the 130 day study. Circle hooks penetrated the lip region significantly more frequently (73%) than J-type hooks (41%). All white seabass mortalities sustained damage to the viscera, confirming that post-release mortality is directly correlated with the location of hook penetration. A 10% mortality rate was observed for fish caught-and-released on both circle and J-type hooks. All mortalities occurred within 5 d post-release. Mortality was reduced when deeply embedded hooks were left in place rather than being removed from the visceral tissue. Hook caught fish showed no reduced growth when compared with control fish, but deeply-hooked fish grew significantly less than fish hooked in the mouth. There was no significant difference in the angler success rates between hook types. We recommend that catch-and-release mortality be incorporated into the management plan for white seabass.

96. MOLECULAR INDICATORS OF CAPTURE RELATED STRESS IN SHARKS

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The post-release survivorship of hooked fishes is a key assumption underlying many fishing practices and the reduction of bycatch of non-targeted fishes. However, little is understood about how cellular stress-threshold-indicator levels correlate with the post-release survivability. Although, most fishes can recover from acute bouts of exhaustive exercise, intense and repeated struggling during capture may lead to significant tissue damage and critical disruptions to homeostasis resulting in higher rates of long-term (>30 days) post-release mortality. This study quantified the presence of specific molecular indicators of cellular stress (i.e., Hsp, heat shock proteins 70 and 90) in the blood of sharks with different levels of swimming activity (i.e., the active shortfin mako shark and the sluggish blue shark) in responses to capture with sportfishing gear and commercial longline gear. Preliminary results for sportcaught sharks show an increase in the levels of Hsps as a function of angling time (i.e., struggle stress) in the mako shark and relatively smaller response in the blue shark. No apparent pattern has emerged for the longline caught specimens. Taken together, this preliminary study provides an initial assessment of molecular stress response in sharks and will serve as the foundation for future studies on the long-

term molecular responses to capture related stress in fishes.

97. THE PHYSIOLOGICAL EFFECTS OF CAPTURE STRESS IN TUNAS, BILLFISHES, AND SHARKS WITH INFERENCES ON POST-RELEASE RECOVERY.

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Sharks, tunas, and billfishes are exploited by recreational and commercial fisheries worldwide, but quotas, minimum sizes, and bag limits result in the mandated release of large numbers of these fishes annually. Little is known of post-release mortality in large pelagic fishes and increased capture-induced mortality has important implications in quota management. To elucidate the physiological consequences of capture-induced stress in pelagic fishes, blood was sampled from 249 tuna, 217 sharks, and 6 marlin comprising 26 species captured on rod and reel, in gillnets, or on longlines. Changes in blood chemistry were correlated to parameters associated with the capture event and compared to baseline estimates derived from free-swimming fish. Blood gases, lactate and cortisol levels, and serum electrolyte, metabolite, and protein profiles exhibited significant quantifiable changes associated with the capture event. The magnitude and nature of these disturbances varied interspecifically with tunas exhibiting the greatest disruption. To investigate short and long term post-release behavior and survivorship, blood sampled fish were tagged with conventional and/or ultrasonic telemetry tags. To date, nine fish have been recaptured and seven bluefin tuna (*Thunnus thynnus*), three yellowfin tuna (*T. albacares*), three blue sharks (*Prionace glauca*), and two white marlin (*Tetrapturus albidus*) have been tracked. With the exception of one bluefin tuna, all the tracked fish survived the duration of the tracks, exhibiting behaviorally distinct recovery periods of ≤ 2 hr. These observations support the hypothesis that pelagic fishes are capable of physiological recovery when handled properly and not subjected to extensive physical trauma.

98. CATCH AND RELEASE STRESS IMPACTS ON FISH: INTERGRATING RESEARCH FINDINGS INTO MANAGEMENT DECISIONS AND ANGLER CATCH AND RELEASE PRACTICES

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How can we incorporate research information on the impacts of catch and release stress on fish into effective management decisions and improvements in release methods? Researcher, managers and fishermen can work collaboratively to develop less stressful release techniques and improve fishery catch and release management rules. Anglers are great innovators whose expertise can be used in designing release devices and methods. Researchers can test how effective the methods are in reducing mortality and stress in fish. Managers can then incorporate the results into effective rules and regulations. Fishermen also should be included in the decision making process for developing catch and release regulations. They can provide important input into what regulations will be enforceable, effective and most likely to gain support among anglers. Buy in by the fishermen can increase compliance and reduce enforcement costs and is necessary for wide acceptance of voluntary catch and release practices. There are many important considerations to consider when designing catch and release methods including sub lethal effects (slow growth, predation vulnerability and reproduction disturbances), long term mortality (from infections, stress, predation), and the experience and fishing methods of fishers. Handling techniques may need to be specific to species and size of fish, environmental conditions,

equipment and boats being used, and water depth. Yet the regulations and practices need to be enforceable (if mandatory) and easy to teach and use.

99. CHARACTERIZATION OF LIGHT HARVESTING-DEPENDENT, CHLOROPLAST LOCALIZED AtcDPPIV DIPEPTIDYL AMINOPEPTIDASE IN *ARABIDOPSIS THALIANA*

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We have used an EST microarray to find genes that show a light-harvesting dependent expression pattern. In our analysis of 7500 genes, one gene showed a clear light harvesting-dependent pattern with higher levels of mRNA observed at low light intensity, and lower mRNA levels at higher light intensity. PSI-BLAST analysis revealed that this gene has the highest identity to uncharacterized genes in soybean (81%) and rice (65%), but also had significant identity to genes found in three different environmental bacteria, *Xanthomonas campestris* (43%), *Chromobacterium violaceum* (43%) and *Caulobacter crescentus* (41%). These genes all contain the dipeptidyl aminopeptidase catalytic triad at the C-terminus. The human gene that is most similar to our gene is named DPPIV, so we named our gene *AtcDPPIV* to indicate it was a chloroplast-localized DPPIV homologue from *Arabidopsis thaliana*. Consistent with the predicted localization of the protease, *AtcDPPIV*:GFP fusions were shown to localize to the chloroplast using confocal microscopy. The mammalian DPPIV protease cleaves the two N-terminal amino acids from short peptide chains when the second amino acid is a proline. We are currently trying to determine the substrate specificity of *AtcDPPIV*. We have obtained two independent T-DNA insertions into the *AtcDPPIV* gene, one in exon 3 and one in exon 6. We have analyzed chlorophyll levels under growth at various light intensities in these *atcdppiv* mutants, but find no significant differences from WT. However, both mutant lines flowered earlier than WT.

100. HIGH-LIGHT INDUCIBILITY RETAINED IN A 216 BP FRAGMENT OF THE *ARABIDOPSIS ELIP1* PROMOTER

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Plants exposed to high-light intensities react to photooxidative stress by immediately triggering transcription of nuclear *ELIP* genes that encode early light-inducible proteins. ELIPs transiently accumulate in thylakoid membranes, and are quickly degraded upon return to low-light conditions.

Five *ELIP1* promoter fragments, ranging from 984 to 158 bp, were ligated next to the *GUS* reporter gene in pBI101, a plant transformation vector. *Agrobacterium*-mediated transformation of *Arabidopsis thaliana* wild type plants was done by the floral dip method. 14-day old transgenic seedlings were exposed to high-light-stress for 4.5 hours, to moderate light for 12 or 24 hours, while controls were left at low-light conditions.

The full-length, 984 bp, *ELIP1* promoter fragment conferred light responsiveness to the *GUS* reporter gene and a 130-fold induction in GUS activity was measured when plants were exposed to high-light-stress. 24-hour exposure to moderate light induced GUS activity only 20-fold, although levels of *ELIP1* mRNA significantly increased. A promoter construct that lacks the 5'-UTR was recently introduced into plants to determine if post-transcriptional regulation plays a role in *ELIP1* expression.

Deletion analyses showed high-light inducibility was conferred by promoter fragments of 579, 383, and 216 bp. The smallest fragment, 158 bp, exhibited significantly reduced photoinduction. These results suggest that the region between 216 and 158 is important for high-light-induced expression of *ELIP1*. PCR-based site-directed mutagenesis of three light responsive elements found in this region (GATA, CACGTG, CAAT), in the context of the full-length promoter, will reveal the *cis*-acting regulatory motif essential for high-light-dependent expression of *ELIP1* gene.

101. VESICULAR TRANSPORT TO THE YEAST LYSOSOMAL VACUOLE

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Selective recognition, sorting, and localization of proteins to the degradative lysosome via vesicular carriers represent an essential feature of all eukaryotic cells. Mislocalization of lysosomal proteases is associated with disease states including lysosomal storage diseases and cancer. Most lysosomal proteases are synthesized in the rough endoplasmic reticulum and transit through the early secretory pathway en route to the lysosome; they diverge from secreted proteins at a trans-Golgi compartment. One major post-Golgi pathway to the lysosome involves the endosome which is responsible for uncoupling of lysosomal proteases from their receptors. While several genes and gene-products have been identified at the pre-endosome and endosome stages of lysosomal delivery, post-endosomal events of lysosomal delivery of luminal hydrolases are relatively poorly defined. Our laboratory is involved in characterization of post-endosomal steps in lysosomal delivery using the yeast *Saccharomyces cerevisiae*. The yeast vacuole is functionally equivalent to the mammalian lysosome, and its carboxy peptidase Y (CPY)-pathway of vacuolar delivery parallels the mannose-6-phosphate pathway in mammalian cells. Yeast offers the advantage of well-developed genetics and molecular genetics. The objective of our studies is to define genes and gene products involved in the endosome to lysosome stage of targeting and delivery of luminal proteases that utilize the CPY-pathway. We have developed a novel mutant screen and have isolated mutants that exhibit internal p2CPY accumulation. The mutants display characteristics that suggest they may be blocked at late stages of carboxypeptidase delivery and processing from the endosome to the vacuole (*env* mutants). We have characterized four *env* mutants genetically, microscopically and biochemically; and are in the process of cloning their putative *ENV* genes.

103. TARGETING OF NEUROLIGIN IN CULTURED HIPPOCAMPAL NEURONS

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Neurons elaborate two distinct types of cellular domains; axons, which transmit information to neighboring neurons, and dendrites, which receive information from neighboring neurons. The precise localization of proteins in axons and dendrites is critical for neuronal function. To achieve this local specificity, axonal and dendritic transmembrane proteins are first sorted into separate vesicle populations in the Golgi apparatus. Carrier vesicles are then transported to the plasma membrane via motor proteins and microtubules. Furthermore, synapse formation in neurons requires even finer protein localization within the membranous domains of the axon and dendrites. The aim of this study is to identify the targeting signal present in the cell adhesion molecule neuroligin. Neuroligin is a critical molecule in the formation of synapses however little

is known about its subcellular localization in neurons and what signals govern neuroligin's targeting. In the current study we determined that neuroligin is polarized to dendritic cell surface of cultured hippocampal neurons and relies on a C-terminal motif for targeting. Since the formation of carrier vesicles relies on discrete stretches of amino acids, we are now determining which amino acids direct dendritic targeting. By understanding the basic cellular mechanisms of the neuron, we will better understand the cell biological basis for the development of the nervous system and the etiology of neurological diseases.

104. PRELIMINARY RESULTS FROM ANAVERDE VALLEY

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Monitoring of construction excavation on the former City Ranch has yielded numerous prehistoric archaeological materials. At least two horizons are represented – a late prehistoric near surface horizon and a probable Milling Stone horizon buried at about 40 cm. Chipped stone and debitage are relatively rare while ground stone is abundant. In the 500 acres graded thus far, no midden has been encountered. Thus, this portion of the valley appears to have been utilized as a processing area(s) with the village elsewhere. Results of the protein residue analysis and preliminary lithic analysis will be presented.

105. PRESERVING ORANGE COUNTY'S ARCHAEOLOGICAL LEGACY

Andrea P. Murray, Department of Anthropology, California State University, Fullerton, CA 92834

It has become clear that a crisis exists in American Archaeology -- the non-renewable record of the human past is eroding before our eyes. Whether through unprecedented urban expansion or a lack of adequate care for excavated collections, the archaeological record is quickly deteriorating. As the number of intact archaeological sites decreases, archaeologists are becoming increasingly more reliant upon pre-existing collections for research. Given this trend, the accessibility and preservation of archaeological collections has become vital to the discipline. The County of Orange, California, sought and received a grant administered through CALTRANS, to develop and begin implementing a model curation program for its archaeological remains. This presentation will discuss the accomplishments of the Orange County Curation Project and will address the curation challenges that the region still faces.

106. THE USE OF FIRED CLAY DAUB FROM CA-ORA-269 IN THE IDENTIFICATION OF PREHISTORIC DWELLING CONSTRUCTION METHODS

Ivan H. Strudwick, LSA Associates, Inc.

The principal type of prehistoric dwelling in southern California was wattle-and-daub. This type of dwelling was made by first constructing a circular, dome-shaped pole framework. Wattle, or bundles of woven sticks or reeds, was then placed upon this framework. The wattle was then packed with daub, which was clay or mud, to weatherproof the dwelling. When the structure burned, the daub was fired and became hardened, similar to fired pottery. Although daub is rarely identified on archaeological sites because it is similar in color and texture to local sediment, waterscreening and laboratory sorting of

excavated material substantially increases its recovery. Daub often contains impressions of vegetation and sometimes human fingerprints. Fingerprints indicate that it was applied by hand. Stick or pole impressions in daub sometimes exhibit a measurable curvature indicating that two general stick diameters were preferred. Thus, the presence of daub not only indicates that prehistoric structures were present, but its characteristics can be used to identify construction methods.

107. ROCK ART AND SOCIAL RITUALS: FEMALE PUBERTY CEREMONIES AND PETROGLYPH MOTIFS AMONG NATIVE CALIFORNIANS

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Ethnographic and historic sources document a metaphorical connection between female puberty rites and rattlesnake motifs among Native Americans of southern Alta California and northern Baja California, one of a broadly held set of beliefs shared among different indigenous groups. Interestingly, these sources also connect facial tattooing associated with female puberty rites to petroglyphs found in this area. Recent research suggests that rattlesnake motifs present at rock art sites may reflect the social practice of female puberty rites. Sites with these motifs have specific environmental features and archaeological signatures, and these patterns are illustrated in archaeological examples from Baja California.

108. THE ARCHAEOLOGY OF REGIONS: AN INITIAL REPORT OF THE WESTERN SANTA MONICA MOUNTAINS-OXNARD PLAIN PROJECT

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Archaeological research in the Santa Barbara Channel and Santa Monica Mountains region has been on-going for decades, but little systematic work has been completed at the regional level. The Western Santa Monica Mountains-Oxnard Plain (WSMOP) project has been initiated to reconstruct the ecological and cultural landscape of the region to determine how resources were used, where and when settlements were located, and what relationship exists, if any, between resource use and the eventual development of social complexity of the late prehistoric indigenous populations. This paper will address the preliminary work conducted to reconstruct the settlement locations in the region, and will consider the project's future plans and goals.

109. LARGE FRACTION FISH MATERIAL FROM SLO-2: FITCH (1972) REVISITED

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John Fitch (1972) published a paper on the otoliths, teeth, and fish scales recovered from an archaeological site in Diablo Canyon, San Luis Obispo County (SLO-2). The technique he used was exemplary because Fitch evaluated the matrix that was laboriously prepared using screens with meshes as small as 0.5 mm. He spent hundreds of hours microscopically sorting the material a spoonful at a time. The exhaustive efforts yielded the remains of over 40 fish species many of which were very small. The large fraction of the fish materials recovered during that excavation of SLO-2 was never evaluated. Over 30 years later we analyzed over 6,000 fish remains that have been in storage. These remains were recovered using 1/4" screens and yielded fish material from

at least 20 fish species, five of which Fitch did not identify. The success Fitch had with his recovery techniques provided another illustration of the need to utilize microscopic examination of matrix to maximize recovery of identifiable materials. These microscopic techniques are particularly important for the recovery of elements from tiny organisms that would not otherwise be noted.

110. THE TALEGA SITE AND ENCINITAS TRADITION PREHISTORY IN ORANGE COUNTY

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Human populations have occupied the Talega Site (CA-ORA-907) for at least the last nine and possibly the last eleven millennia. During this time, six meters of sediment have been deposited in short-term episodes separated by substantial periods of depositional stability during which pedogenic processes acted on the surface of the sediment body forming soils. These soils have produced abundant evidence of prehistoric human occupation divided into seven stratified cultural components. Cultural features include the remains of early Holocene dwelling as well as a large number of burnt rock features. Similarities in basic flaked stone technologies as well as architecture suggest cultural continuity throughout the occupation of the site spanning much of the Encinitas and Late Prehistoric occupation of the site.

111. THE CHIPPED STONE TOOLS OF CA-ORA-840, A MILLINGSTONE HORIZON SITE IN SOUTHERN ORANGE COUNTY

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Analysis of tool assemblages collected from archaeological sites can provide information about when the site was occupied, the activities of the residents, seasonality, and residential mobility, as well as how many different groups might have used the site. CA-ORA-840 is a Millingstone Horizon site situated ten miles inland on a bluff overlooking San Juan Creek. Excavators at CA-ORA-840 recovered almost 350 stone tools, over 400 edge modified flakes, and over 25,000 pieces of stone debitage. All of the stone tools were analyzed, as well as 25% of the edge modified flakes. Size, form, edge angles, edge wear, and material type were recorded. This paper discusses observed lithic tool types in the assemblage and suggests possible tool utilization, site function, and site occupation

112. BOTANICAL TERMS AMONG THE UTO-AZTECAN SPEAKERS OF SOUTHERN CALIFORNIA

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The primary importance of plants to the lives and economy of Southern California Native Americans is well documented. Approximately 85% of their food was derived from plants; medicines, building material and baskets were derived from plants, as well as much of their clothing, tools, and ceremonial regalia. The cultural importance of plants is reflected in the linguistics of the region's tribes, there being over 220 named individual species and categories of plants. Linguistic, environmental, and cultural relationships exist between the several Takic speaking social groups, the Gabrielino and Serrano of the Northern (Serran) Takic Branch, and the Cahuilla, Cupeño, Luiseño and Acjachemen of the Southern (Cupan) Takic Branch. The native terms among these peoples for 175 plants were reviewed. The great majority of the terms

are very similar from one language to the next, and even from one language branch to the other, more so on average than with the rest of their vocabulary. Most differences, or gaps, are likely the result of different environmental conditions rather than strictly cultural.

113. FISHING AND MARINE MAMMAL HUNTING PATTERNS FROM A 2500-YEAR OLD CAMPSITE ON SAN NICOLAS ISLAND.

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Preliminary archaeofaunal results are presented from a 2500-year old campsite on San Nicolas Island, the most isolated of the southern Channel Islands. Data indicate that large quantities of fish and a smaller number of sea mammals were transported to this campsite, which is in the highest area of the island and several kilometers from the coast. At least 10,000 bone fragments are represented in the vertebrate archaeofaunal assemblage. California sheephead (*Semicossyphus pulcher*), indeterminate surfperch (Family Embiotocidae), and cabezon (*Scorpaenichthys marmoratus*) are among the identified fish species. As indicated by the presence of large numbers of cranial and post-cranial remains in the assemblage, most of the fish were transported to this site as complete individuals, where they were butchered, cooked, consumed, and discarded. Marine mammals include sea otter (*Enhydra lutris*) and pinnipeds. Small portions of whalebone are also represented. Cutmarks from butchering are evident on several otter elements. Hunting and fishing patterns are discussed with regard to prehistoric local and regional overexploitation and resource depression in the late Holocene. Since archaeofaunal studies can provide long-term trends in animal population dynamics, the data have implications for modern conservation biology in the Channel Islands.

114. THE ROLE OF MACROPHYTES IN THE DIETS OF THE SUSPENSION-FEEDING MUSSEL *MYTILUS CALIFORNIANUS* ON SOUTHERN CALIFORNIA SHORES: A CARBON ($\delta^{13}\text{C}$) AND NITROGEN ($\delta^{15}\text{N}$) STABLE ISOTOPE ANALYSIS

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Benthic intertidal consumers can obtain food derived directly or indirectly from both phytoplankton and macrophyte (algae and seagrass) sources. Carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) stable isotopes have been used successfully to show that macrophyte production, particularly through detrital pathways, is an important contributor to benthic consumer diets in colder seas characterized by large algal beds. The purpose of this study was to examine macrophyte contributions to food webs on southern California shores by focusing on *Mytilus californianus*, a suspension-feeding mussel found in abundance throughout the region. Dietary inputs to mussels were determined by comparing $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values for multiple macrophyte and phytoplankton sources with the stable isotope signatures for mussels collected from urban coastal and offshore island habitats characterized by variable macrophyte standing stocks. $\delta^{13}\text{C}$ stable isotope values averaged -14.8‰ for macrophytes and -21.0‰ for phytoplankton-containing ocean POM. Using these values in a two-source mixing model, we calculate that macrophytes contribute approximately 50 % of the carbon to mussel diets at all of our mainland sites, even those lacking large algal or seagrass beds. Mussel $\delta^{15}\text{N}$ values were similar among sites with a mean of 11.0‰ and were enriched by 1.5‰ over nitrogen values in macrophyte and POM sources. Mussels from

Santa Catalina Island, an offshore, oligotrophic site, had distinct and more depleted $\delta^{13}\text{C}$ values (-18.7 ‰) compared with mussels from the mainland, indicating greater dietary contributions of planktonic POM.

115. AGE AND GROWTH OF THE ROUND STINGRAY, *UROBATUS HALLERI*, AT SEAL BEACH, CALIFORNIA

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The round stingray, *Urobatis halleri*, is a common nearshore elasmobranch, occurring in high numbers at Seal Beach, California. The round stingray is investigated to estimate the age and growth parameters of the population, which can be applied to demography and management of the population. In elasmobranchs, growth rings that form in the vertebrae are used to estimate age. Round stingrays were collected during monthly beach seines in 2003. A subsample of ten stingrays per month were sacrificed and a section of the vertebral centra was used to estimate age (n=84). The von Bertalanffy growth model was applied disc width at estimated age producing a maximum disc width of 241.3 mm for both sexes combined. The oldest animal was estimated to be 14 years of age with a disc width of 239 mm. The predicted maximum disc width is smaller than the reported 300 mm maximum disc width for round stingrays, but is larger than that of related species like the stingree, *Urolophus lobatus*. The growth coefficient (k) of 0.23 estimated for the round stingray falls within the accepted range of 0.1 to 0.3 for elasmobranchs but is two to three times smaller than that of *Urolophus lobatus*. Other related species like the bat ray, *Myliobatis californica*, have larger maximum disc widths and smaller growth rates. Preliminary analysis suggests that the round stingray may show longevity of ten to fifteen years and may show intermediate growth rates compared to other elasmobranch species.

116. ASPECTS OF THE LIFE HISTORY OF THE BLACK CROAKER (*CHEILO TREMA SATURNUM*) FROM WITHIN THE SOUTHERN CALIFORNIA BIGHT.

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The black croaker, *Cheilotrema saturnum* (Girard), is a common member of the nearshore fish assemblage off Southern California. Overnight gill nets were set bimonthly from April to October from 1995 – 2003 to sample the nearshore ichthyofauna. Black croaker were collected and processed to determine their physical characteristics, sex ratios, growth, reproductive periodicity and distribution (both size and spatial) throughout the range of sampling. Specimens ranged from 126 to 362mm standard length and 40 to 750g total weight. The mainland was found to support a significantly greater population than the offshore Channel Islands. Conversely, specimens captured at the Channel Island were significantly smaller than those from the mainland. The sex ratios over age and length indicated a gonochoric pattern, with the primary spawning period being late spring early summer based on gonosomatic indices. Catch per unit effort (CPUE) data suggests the Palos Verdes Peninsula supported the largest population sampled within the Southern California Bight.

117. MICROHABITAT COLOR PREFERENCES OF FOUR *TEGULA* SPECIES IN DANA POINT, CALIFORNIA

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Although the influences of both physical and biological factors on the distributions of rocky intertidal organisms have been well studied, little information exists on the influence of microhabitat colors on those distributions. In the present preliminary study, microhabitat color preferences of four *Tegula* snail species (*Tegula funebris*, *T. gallina*, *T. eiseni*, and *T. aureotincta*) from Dana Point, California were determined by exposing snails in the laboratory to colors and observing the preferred fields. Both *Tegula eiseni* and *T. aureotincta* showed no preference for any of the colors tested, whereas, *T. funebris* and *T. gallina* most often selected fields with darker colors. Attempts were also made to determine if the *Tegula* snails used visual cues to identify food, predators or other *Tegula* snails. Field studies at Dana Point were also conducted to determine if similar color preferences as those observed in the laboratory also existed under natural conditions.

118. GENE FLOW AMONG SPOTTED SAND BASS, *PARALABRAX MACULATOFASCIATUS*, POPULATIONS WITHIN THE SOUTHERN CALIFORNIA BIGHT

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It is the goal of this study to examine the degree of genetic structure among populations of the spotted sand bass, *Paralabrax maculatofasciatus* within the southern California bight. Within the southern California bight, *P. maculatofasciatus* are found to inhabit shallow warm-water habitat such as bays and harbors, which provides a warm water refuge for this species. Due to this unique habitat requirement, movements of individual adult fish are restricted, thus, gene flow among populations is accomplished through long-range dispersal of eggs and larvae via coastal currents. Hence, *P. maculatofasciatus* serves as an ideal model to test the role of gene flow among geographically distant populations. The degree of genetic variation will be investigated through the amplification and direct sequencing of the mitochondrial control region. Comparison of DNA sequences will be used to test the null hypotheses of no difference in genetic variation both, among population and among age classes within populations. The information gained from this investigation will enhance both our understanding of the level of genetic diversity among *P. maculatofasciatus* populations as well as the level of connectivity among populations of marine organisms with a pelagic dispersal phase.

119. THE *CYP1B1* L432V POLYMORPHISM AND RISK OF COLORECTAL CANCER

Gloria Chi, Alhambra High School

The *CYP1B1* gene is located on chromosome 2p21-p22 (Tang et al., 1996) and is a member of the cytochrome P450 family. The cytochrome P450 family is involved in the metabolism of many substances including procarcinogens. *CYP1B1* is involved in the metabolism of procarcinogens such as polycyclic aromatic hydrocarbons and heterocyclic amines

into genotoxic metabolites (Shimada et al. 2001, Oda et al. 2001). These heterocyclic amines are associated with colorectal cancer. The Leu to Val polymorphism at codon 432 in exon 3 was found to be associated with susceptibility to head and neck squamous cell cancer in smokers (Ko et al., 2001). The Leu / Val variant has also been found to be associated with colorectal cancer in one study of German individuals (Fritsche et al., 1999). The *CYP1B1* L432V polymorphism should be associated with an increased risk of colorectal cancer because it is involved in the metabolism of heterocyclic amines.

In this experiment, four ethnic groups were studied to see whether they had a difference in gene frequency of the *CYP1B1* L432V polymorphism. Four ethnic groups were included in this study, the Asians, the Blacks, the Latino Whites, and the Non-Latino Whites. Sample DNA were from subjects who underwent a sigmoidoscopy in either of the two Southern California Kaiser Permanente Centers (Bellflower and Sunset, CA) during the period from January 1, 1991 to August 25, 1993. The samples DNA were subjected to PCR amplification and *Pst*I digestion. The PCR products were ran through gel electrophoresis. The results suggest the Blacks had an increased frequency of the polymorphism while Asian Pacific group had an increased frequency of the homozygous C/C genotype. Further analysis is necessary.

120. THE EFFECTS OF DYNEIN AND KINESIN ON THE INTRACELLULAR MOVEMENTS IN THE PARIETAL CELLS

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The parietal cells are found within the stomach lumen that secretes hydrochloric acid. H, K-ATPase is the protein pump, which is responsible for acid secretion. When there is a stimulus, H, K, ATPase is moved from the cytoplasm to the apical membrane. When H, K-ATPase is at the apical membrane, acid secretion starts. I believe that the movement of H, K-ATPase involves two microtubule based motor proteins, Dynein and Kinesin. This is because motor proteins have been known to be involved in intracellular movements in other body parts' epithelial cells. These motor proteins transport organelles inside the cell along a filamentous track. I decided to do a project to see if the motor proteins are involved in the movement of H, K-ATPase in parietal cells. I had two problems: Are microtubule based motor proteins, dynein and kinesin, involved in the intracellular movement of H, K-ATPase in the parietal cells? If so, what role do they play? I propose to do this through Western Blots and Immunofluorescence. Before I work with western blots, I had used Coomassie blue stain to see if there is any H, K-ATPase present in the proteins. After my experiments, it was found that H, K-ATPase was found present in all of the protein samples. It was also found that dynein was found in the gastric tubulovesicles. With my results, I can conclude that H, K-ATPase is a major component found in the parietal cells. The protein pump moves back and forth of the basolateral surface and apical membrane through dynein and kinesin.

121. ANALYSIS OF FERRITIN EXPRESSION IN VARIOUS CELL LINES WITH FLOW CYTOMETRY

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Cancer is known to be the second leading cause of death. The purpose of this study was to analyze the expression of the iron-storage protein heavy-chain ferritin in various cancer cell lines.

A correlation was predicted to be the higher amount of ferritin, the higher amount the regulatory T cells will be activated. Previous studies showed that melanoma cell lines that expressed ferritin had higher percentages of T-regulatory cells. The cell lines analyzed include: Raji, MT-1, YT-2C2, TPH-1-0, DEV, L540, Colo 667, Holm-3, Su-DHL-4, Su-DHL-6, Su-DHL-10, and Su-DHL-16. Each cell line had 3 sample tubes: control, cells with the secondary antibody only, and stained. The TPH-1-0 cell line showed the highest percentage of ferritin expression (98.13%) and the Su-DHL-16 came in second highest with a ferritin expression percentage of 80.28%. The DEV cell line had the lowest expression of ferritin (2.74%) with its secondary antibody control expressing a ferritin percentage of 3.85%. This means that the DEV cell line does not contain ferritin at all. Future studies will involve injecting ferritin-positive cell lines into separate mice. The cells will be collected and stained to determine whether there is a correlation between the amount of ferritin and the regulatory T cells or not.

122. IDENTIFYING NEURAL REGIONS RESPONSIBLE FOR LIFESPAN IN DROSOPHILA

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Mentor/Teacher: David Walker [Benzer Lab, Caltech] Duane Nichols [Alhambra High School].

Towards the identification of the neural regions that regulate the longevity of *Drosophila* I am selectively targeting a dominant negative of the Shibire gene, which controls vesicular trafficking at synapses to brain regions and subsequently assaying the effect on longevity. The Shibire gene is temperature sensitive, inactive at 29° C. I have obtained a vast panel of GAL4 'driver' lines that are expressed in different brain regions. I am using these lines to screen for neural regions that when silenced, via Shibire, confer enhanced longevity. 102 potential candidates were tested and I have identified one candidate GAL4 line which displays longevity, by surviving for 43 days, as compared to the wild type that survives for 30 days; the strain outlives the wild type by 13 additional days, approximately 43%. Using fluorescent microscopy, I identified the neuronal expression, and found the GAL-4 to be expressed in the mushroom body which is homologous to the hippocampus in animals. From this research it can be concluded that the mushroom body plays a vital role in determining lifespan, and can be used to study the role of brain structures and their functions in different neuro-degenerative diseases.

123. THE EFFECTS OF PROGESTIN ON THE HORMONE RECEPTOR CONTENT OF HUMAN ENDOMETRIAL EXPLANTS.

Dorothy Chan, Alhambra High School, *Mentor: Dr. Juan C. Felix*

Anti-progestin, mifepristone has been recently demonstrated to diminish breakthrough bleeding in users of progestin contraceptives. The purpose of this study was to investigate the use of cultured endometrial explants to study the effects of mifepristone and medroxyprogesterone acetate (MPA, progestin) on endometrial sex steroid receptors. To address this question, I used endometrium obtained by biopsy during the secretory phase, and cultured for 72 hours in the absence and presence of MPA, mifepristone and MPA plus mifepristone, respectively. Explants were then frozen for total RNA isolation or fixed in 10% formalin for morphological and immunohistochemical analysis. I found that the tissue showed little or no necrosis up to 72 hours of culture on H & E staining. Immunostaining with anti-Ki67 antibody, a proliferation marker further demonstrated the viability of the explants. The expression changes of hormone receptor following the treatment were confirmed by both RT-PCR and immunohistochemical analysis.

From this study I learned that the tissue viability of endometrial explants can be maintained in culture up to 72 hours. The explants culture can be used to directly evaluate the induction or repression of gene products in the human endometrium by progestins and anti-progestins. The culture of endometrial explants offers the advantage of maintaining the tissue in a similar environment as *in situ*. Several studies based on the culture of explants or isolated endometrial cells have greatly enriched our knowledge on the effect of ovarian steroids on endometrium.

124. INHIBITING THE GROWTH OF AN EWING SARCOMA TUMOR CELL LINE USING SIRNAS DELIVERED AS COMPLEXES TO CDPS THAT TARGET THE EWS/FLI-1 ONCOGENIC FUSION GENE.

S.B. Ha and J. D. Heidel. Mark E. Davis Research Group, California Institute of Technology, Department of Chemical Engineering, Pasadena, CA, 91125.

Ewing sarcoma is a cancer caused by a chromosomal translocation t(11;22) that often results in the generation of the EWS-Fli-1 fusion gene. Intracellular levels of this fusion protein can be reduced by targeting the messenger RNA transcript for degradation through a process called RNA interference (RNAi). RNAi is achieved by delivering small interfering RNAs (siRNAs) to the cytoplasm of cells causing the inhibition of growth. Commercially available lipids as a delivery vehicle are too highly toxic, rendering it unsuitable for the target application for siRNA as a therapeutic. Therefore, the laboratory of Mark E. Davis synthesized cyclodextrin-containing polycations (CDPs), which have been shown to be effective delivery agents for DNA and small molecules in cultured cells and animals. The primary objective of this study is to inhibit the growth of an Ewing sarcoma tumor cell line by delivering siRNAs as complexes to CDPs that target the EWS/FLI-1 fusion gene. First, determined the ratios of CDP to siRNA necessary to form complexes using dynamic light scattering and gel electrophoresis. Next, I examined the uptake of complexes made with fluorescently labeled siRNAs in cultured Ewing sarcoma cells at a variety of siRNA doses using a process of flow cytometry. Results have proven that the ability of siRNA can uptake cellular growth. I hope to continue further study in determining the cellular growth kinetics, variations in CDP-to-siRNA ratios, and sequence specificity of the effect of siRNA. For, enhancement of greater knowledge will prove more successful discovering a cure for the Ewing sarcoma cancer.

125. PROGESTERONE RECEPTOR EXPRESSION AND LOCALIZATION IN ADULT MONKEY TESTES.

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Over the decades many female contraceptives have been created and modified. There have been no big advances on the male contraceptives—condoms and vas occlusion. Hormone male contraceptives, similar to female birth control pills, are still in the trial stage. Demonstrations have proved that the addition of testosterone combined with progestin (synthetic form of progesterone) suppresses spermatogenesis and is more effective than the other preventatives. Besides further suppressing the gonadotropins (hormones that stimulate the testes), progestin may have a direct effect on the testes, with the help of the progesterone receptor (PR). To determine whether the progesterone receptors were expressed, and where they were localized in adult cynomolgus monkey testes, testicular samples from 8 adult monkeys (7-10 years old) were used

in this study. Testicular biopsies were performed on the monkeys in aseptic conditions under anesthesia. One portion of each of the testicular samples from each animal was frozen into liquid nitrogen for Western blot, and another portion was fixed into Bouin's solution, paraffin embedded, and sectioned for immunohistochemistry. The results showed in the Western blot analysis the presence of three bands migrating at approximately 114 kDa, 94 kDa, and 60 kDa, which parallel the molecular weight corresponding to PR-B, PR-A, and PR-C. The immunohistochemical analysis showed the presence of positive PR immunoreactivity intracellularly in Leydig cells, Sertoli cells, pachytene spermatocytes, and elongated spermatids in the adult monkey testis. We conclude that PRs are expressed in the monkey testes. The functional roles of the PRs have yet to be examined.

126. THE DISTRIBUTION AND BINDING PARTNERS OF KINESIN II IN RABBIT LACRIMAL ACINI

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Kinesin II is a motor protein that drives the plus-end transport of membrane organelles along microtubules. This study explored the role of kinesin II in lacrimal acinar membrane trafficking. Cultured rabbit lacrimal acinar cells were treated with 100 μ M carbachol (CCH) for 15 min. Confocal microscopy of resting acini revealed kinesin II immunofluorescence in a punctate pattern beneath the apical membrane and throughout the cytoplasm with colocalization with rab6, rab11 and p150^{Glued}. CCH stimulation increased the intensity of kinesin II beneath the apical membrane and the extent of its colocalization with rab11 and p150^{Glued}. Analysis of kinesin II distribution on membranes isolated over sorbitol density gradients revealed enrichment in fractions 5-12. CCH induced an increase of kinesin II in fractions 5-7. CCH enhanced the co-immunoprecipitated p150^{Glued} from cell lysates by antibody to kinesin II. The increase in kinesin II-p150^{Glued} association in CCH-stimulated acini was confirmed in co-immunoprecipitation of kinesin II with antibody to p150^{Glued}. The following can be concluded from the results: in CCH-stimulated acini, p150^{Glued} is present on secretory vesicles driven into the apical region by cytoplasmic dynein. Coupled retrieval of exocytosed membrane by kinesin II from subapical endosomes to the Golgi may be mediated by its regulated binding to p150^{Glued} once cytoplasmic dynein is released.

127. SUSCEPTIBILITY OF OXIDATIVELY CROSSLINKED AMYLOID BETA-PROTEIN TO INSULIN-DEGRADING ENZYME

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Amyloid- β protein ($A\beta$) plays an important role in the pathogenesis of Alzheimer's disease and is the cause of neuronal deaths. Oxidized $A\beta$ and oxidatively crosslinked were examined to see if they were less susceptible to protease digestion by IDE, a major $A\beta$ -degrading enzyme and compared to digestion by the more general protease, trypsin. $A\beta_{40}$ and $A\beta_{42}$ peptides were each oxidized with either NBS or Cu^{++}/H_2O_2 . Oxidized $A\beta$ peptides were lyophilized and resuspended and then desalted using C18 spin columns. A BCA protein assay was used to determine the recovery of $A\beta$ from the columns. Non-oxidized and oxidized $A\beta_{40}$ and $A\beta_{42}$ were subjected to proteolysis with IDE or trypsin. $A\beta$ samples were electrophoresed and were

analyzed by Western Blot and the results were captured on x-ray film. The conclusion for the experiment was trypsin is able to digest unoxidized A β ₄₀ and A β ₄₂ but not the oxidized samples. IDE wasn't able to digest the unoxidized and the oxidized sample, which was a deviation from previous research, which have shown that IDE is able to degrade unoxidized A β . This deviation may be due to problems with the IDE or IDE's activity with the A β ₄₀ and A β ₄₂.

128. DETECTING SNPs IN EXON 1 OF THE *HOXA10* GENE OF CRYPTORCHID PATIENTS

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Cryptorchidism is the testicular maldescent in male infants. *HOXA10* is a homeobox gene that regulates gene expression and differentiation. Disruptions of the mouse homologue of this gene, *Hoxa10*, cause cryptorchidism. It is proposed that disruptions in *HOXA10* predispose human males to cryptorchidism. Abnormal *HOXA10* gene expression is caused by genetic polymorphisms. The goal of this study is to detect for polymorphisms in exon 1 of the *HOXA10* and associate them with cryptorchidism. DNA was extracted from human blood from cryptorchid subjects in a study at USC. Control cases amplified products in exon 1 by PCR, using oligonucleotide primers. The DHPLC analysis screened DNA fragments for SNPs. An elution profile for the DNA fragments show heterozygous or homozygous profiles, identified by peak formation on the chromatograms; heterozygous profiles indicate polymorphism(s). Control DNA samples were run under non-denaturing conditions; a possible deletion was detected. Verification via analysis by DHPLC and sequencing needs to be done. Thus, analysis of samples from cryptorchid boys was not initiated due to incomplete verification. As a member of the homeobox gene family, the primers of *HOXA10* (comprised Hox proteins) may dimerize with DNA, leading to amplification of sequences of other HOX genes, causing complications in specific amplification for this study.

129. PHAGOCYTOSIS AND CYTOTOXICITY OF NICKEL OXIDE

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Lung cancer kills more individuals than any other leading cancer in both women and men. Not only does lung cancer metastasize as it progresses to its advanced stage, lung cancer is also associated with nose cancer, larynx cancer, prostate cancer, and other cancers. Although lung cancer is predominantly caused by smoking in 87% of its cases, the exposure to carcinogens, such as nickel can also increase the likelihood of achieving lung cancer. Nickel has been believed to be a cause of nasal and lung cancer in nickel refinery workers exposed to these compounds. By studying the induction of phagocytosis and cytotoxicity transformation by insoluble nickel compounds, Nickel Oxide and QNi Nickel compact were compared against their toxicity in C3H/10T1/2 Cl 8 (10T1/2) mouse embryo fibroblasts. After supplementing cells with concentrations ranging from .1325 μ M.mL for Nickel Oxide (NiO) and QNi Nickel Compacts (QNiC), cells revealed that they were more susceptible to phagocytocize NiO. The uptake of these nickel compounds also caused programmed cell dead (apoptosis).

130. HIPPOCAMPAL EXPRESSION OF BDNF 5' EXONS IN AGED FISHER RATS

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Mentor: Dr. Amelia Russo-Neustadt

Brain-derived neurotrophic factor (BDNF) is part of the neurotrophin family, and has been implicated in the enhanced survival and function of developing and mature neurons. The rat BDNF gene contains four promoter regions, each of which generates a unique transcript form containing one of four 5' exons and a common 3' exon. The tissue for this study was taken from two trials, 2 and 14 days in length, in which aged Fisher-344 rats were subjected to daily intraperitoneal injections of the antidepressant tranylcypromine or saline (control). Half of the tranylcypromine and saline-treated rats were provided with running wheels, and the other half was sedentary (control). Relative exon mRNA expression levels were assayed with ³⁵S-labeled riboprobes on cryostat-sectioned tissue. The autoradiographic films were analyzed for each of the five distinct regions of the hippocampus and the four 5' exons. Expression of the 5' exons increased markedly with antidepressant treatment, and also when exercise was included. The sedentary rats that received saline had the lowest BDNF expression levels. As each exon is linked with a different promoter region, their differential expression could shed light on the mechanism of BDNF activation by exercise.

131. EFFECTS OF PHOSPHATE ON THE BIOLOGICAL PROCESSES OF TRICHODESMIUM

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The marine cyanobacterium *Trichodesmium* occurs throughout the tropical and subtropical oceans. These bacteria are unusual in their ability to convert atmospheric nitrogen into ammonium while undergoing photosynthesis and are responsible for the majority of the nitrogen supply in the open oceans. In exploiting their ability to fix nitrogen, the use of the oceans as a carbon dioxide sink can be maximized, helping to alleviate global warming. This research focused on the role of phosphate in the biological processes of *Trichodesmium* and its effect as a limiting nutrient. It is postulated that *Trichodesmium* has the ability to hydrolyze inorganic molecules to obtain an additional source of phosphorous, known as alkaline phosphatase activity (APA). This experiment tests *Trichodesmium's* APA response in 6 different phosphate concentrations with an inorganic molecule, 4-methylumbelliferyl phosphate (MUF-P). An inverse relationship between the phosphate concentrations and the amount of MUF-P hydrolyzed was found, confirming the theory that the cyanobacterium has the ability to provide itself with additional phosphorous, should the need arise. The experiment also analyzed the relationship between the concentration of phosphate available and the nitrogen fixing ability of *Trichodesmium*. Using the acetylene reduction process, a direct relationship between the two components was found, verifying the role of phosphate as a limiting nutrient. A better understanding of the role that phosphate plays in maintaining a elemental balance in the open oceans is essential in implementing the use of the oceans as a biological sink for carbon dioxide, thus lessening the major threat that global warming currently presents

131a GENE MUTATION IN DYDKERATOSIS CONGENITA- STUDY OF EXON 8.

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Abstract.- *Dyskeratosis congenita* (DKC) is an x linked disease which affects only males. Its symptoms are dystrophy of the nails, leukoplakia in the mucus membrane, and often anemia. The goal was to find a discrepancy in the DNA base pairs in order to find the mutation or the cause of *dyskeratosis congenita*. A blood sample was obtained for a research from a patient diagnosed with this disease. Three stages took place in this experiment: PCR, DNA sequencing, and then BLAST. First, the DNA samples were put through PCR (Polymerase-Chain Reaction) to create copies. The primers ordered were specially used to amplify the DKC gene only. Then, an electrophoresis gel was run to find the right sized exon. The gel uses positive and negative poles to allow samples to be pulled across its porous surface. The size of the exon that was necessary was four-hundred base pairs. UV rays, in the transilluminator were used to find the PCR products of the gel. The DNA sequencing was done by creating a much larger gel, and color coding each base pair. Then a laser was able to read which specific base pair was in the exon. This printed out the base pairs in exon 8. Next we used BLAST, a DNA database program from GenBank to check for mutations. The sample of exon 8 in the patient's DNA, was found to not contain a mutated base pair. This finding has enabled us to start checking other exons to narrow our future search.

132. PHOTOMETRIC DETECTION OF AN EXTRA-SOLAR PLANETARY TRANSIT ACROSS HD 209458 PHASE II – VOLUMETRIC ANALYSIS AND EXTRAPOLATION FOR SYSTEM– TECHNIQUES FOR INDIRECT DETERMINATION OF PROTOPLANETARY DISKS

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Phase I - I report photometric measurements of HD 209458, an extra-solar planetary system known to have an orbiting planetoid of Jupiter mass by radial velocity measurements. The star has been observed with a 10" Meade Schmidt-Newtonian LXD 55 telescope and a thermo-electrically cooled Nikon Coolpix 995 CCD. I detect two full transits at projected transit times defined by radial velocity measurements (Mazeh et al.). An accuracy of +/- 0.01 stellar magnitudes has been achieved using the equipment described. The photometric dimming observed, attributed to the transit of a planet across the stellar disk, is consistent with past photometric measurements made by considerably large observatories (Hubble, Keck I) and provides one of the first small aperture extra-solar planetary detections to date.

Phase II - Photometric data is used to simulate the extra-solar planetary system. Atmospheric expansion of HD 209458b is extrapolated and interactions within the system predicted. Simulation techniques are applied to the indirect determination of proto-planetary disks and their density structure.

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133. THE CHEMICALLY DEFINABLE DIFFERENCES BETWEEN A WATER WASH AND NON-WATER WASH SYSTEM IN ANALYSIS OF WATER CONTENT.

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The water wash process used to cleanse Bio-diesel fuel was compared to a non-water wash system composed of an investigative media. Research describes the media as polymer beads that stripped the fuel of water and glycerin molecules as well as reduced the pH level. Samples of tap water (control), water wash oil (independent variable), and non-water wash oil (dependent variable) were tested using a filter methodology with a ratio of the media to the specific liquid substance (50 g: 100 ml). A combination of synchronized temperature markings determined the exothermic reactions in each sample and a weight system measured the absorption rate the media had on each liquid. Subsequent to the testing of the non-water wash using the media, virgin batches of soy oil were processed through the water wash and a designed apparatus operating on the non-water wash system. Results indicated the non-water wash to be without absorption of water, while the water wash contained a significant level of water content. The collected data showed promising results to further testing with regards to an experimental design and randomized data in order to fully understand the entirety of the two processes.

134. ALGORITHM PERFORMANCE ON THE SATISFIABILITY PROBLEM

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The satisfiability problem is very important because of the NP-complete nature of the problem. By generalizing an efficient way to solving this problem, it can be applied to problems that have the same NP-complete property.

The Satisfiability problem consists of clauses and variables. The variables have two solutions: True or False. Clauses comprise of variables connected through OR operators. In some cases, NOT operators are situated at the front of variables. They are used to negate variables. All clauses are further linked to one another using AND operators.

Using three algorithms, a comparison was done to see which algorithm proved to be most efficient when dealing with a range of satisfiability problems. The genetic algorithm creates a population of solution sets and hybridizes them depending on their fitness level. The hillclimbing algorithm generates a random solution set and manipulates it to fit the constraints set by the clauses. The simulated annealing algorithm is a variation to the iterative improvement algorithm, but allows for moves that are less satisfiable to the problem in an attempt to find a more satisfiable solution thereafter.

Due to the diversity of satisfiability problem, the experimentation was divided into three categories: satisfiable problems, unsatisfiable problems, and unknown problems. Satisfiable problems had a clause to variable ratio of 1:1. Unsatisfiable problems had a ratio of 10:1. Unknown problems had a ratio of approximately 4.25:1.

135. DESIGN AND CREATION OF A LOW-COST VOLUMETRIC DISPLAY DEVELOPMENT SYSTEM.

Michael McDaniels, California Academy of Science and Math

A Volumetric Display System was designed and created using a rotating helical screen, based on the concept of R. Hartwig, using the RCX microprocessor, components, and bricks made by LEGO, a fiberglass screen, and a common laser pointer. The helical screen was constructed from transparent resin applied to fiberglass cloth fitted to a helical mold. Various combinations of gears were used to determine the optimal rotational speed of 3 times per second, giving a 3Hz refresh rate at approximately 7500mV to 9000mV of voltage. Numerous programs and computer functions were created to control such variables as motor rotation speed, laser pulse rate, laser pulse length, among others with the RCX's default firmware, an alternative programming language known as NQC, and the BrickCC IDE. The setup proved effective in projecting stationary voxels in the 3D medium as well as multiple pixels at the same time. Due to a lack of outputs, an X-Y positioning system was not implemented.

136. MICROBIAL RESPONSE TO EXPOSURE FORM VARIOUS STRESSORS

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Infections with gram-positive, gram-negative, and fungal organisms resistant to multiple antibiotics are an emerging clinical problem. Although humans employ several stress mechanisms to prevent and limit the microbial colonization, distinct types of microbial diseases cause destruction of body tissues, blood clotting, and *Typhoid fever*. This study involves several types of biochemical stresses such as oxidation, membrane injury, osmotic stress, and DNA damage that were introduced to determine the concentration at which they were inhibited. This was done by finding Minimal Inhibitory Concentration and Minimum Microbicidal Concentration methods. The results indicated that Bacteria and Fungi had significantly different stress resistance when grown in minimal nutrient and complex nutrient media. Indicating that the amount of stress used affect the organism, but also the environment plays a key role. It was significant to find out that the gram-positive *Staphylococcal* strains, found on the skin, were least affected by *Sodium chloride* in Muller Hinton Broth, a complex medium containing tissue from the brain and heart of a cow, while Nutrient Broth was most affective with *Sodium chloride*. Air bubbles of Oxygen seen as a byproduct on plates may have contributed to the way stress affected the organisms and resulted from the degradation of *Hydrogen peroxide* by catalase. This means that *Hydrogen peroxide* was reaching high levels in the bacteria and the bacteria were reacting by catalyzing it into less harmful, and useful, by-products. Although the stressors are simplistic, the result will be taken by pharmaceutical companies to be used in and combined with antibiotics.

137. STRAIN RELATEDNESS OF *CANDIDA* IN HUMANS: A URINARY PATHOGEN OR COLONIZER?

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Candida species in the urine of hospitalized patients (candiduria) is a very common occurrence among hospitalized patients with over 50,000 cases complicating hospitalizations annually. However, the clinical significance of candiduria remains controversial as there is evidence that

this may represent a potentially serious and deadly infection that may spread to the bloodstream, or, alternately, merely represent urinary tract colonization. To resolve this, samples of urine from over 300 patients from Harbor-UCLA Medical Center were analyzed, and data regarding the patient's fungal infection or colonizations in different body sites, as well as their patterns of uses of antifungal medicines and urinary catheters were recorded. Differences in strains of each *Candida* infection were examined using traditional speciation methods as well as molecular techniques (DNA fingerprinting). The results of this experiment show that *Candida* in the urine commonly resolves spontaneously (97.4% of specimens) and can recur with either the same *Candida* strain (76.3%), or a different strain (23.7%). Furthermore, patients with Candiduria and Candidemia were more likely to lack strain relatedness (88.9%) than have strain relatedness (11.1%). Finally, antifungals did not have any effect on the persistence (3 versus 2.446) nor the recurrence (2.67 versus 2.53) of fungal infections. Consequently, *Candida* in the urine among hospitalized patients does not appear to be associated with serious *Candida* bloodstream infections. Candiduria infections tend to wax and wane with time, and occasionally are supplanted with other *Candida* strains. This suggests that most *Candida* strains have low pathogenicity in hospitalized patients and may not require treatment.

138. DETERMINATION OF BACTERIAL AND POLLUTANT FLOWS IN COASTAL ESTUARIES OF SOUTHERN CALIFORNIA

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There are two main objectives of this experiment: to create a mathematical model showing the relationship between turbidity, dissolved oxygen, pH, and levels of indicator bacteria for fecal contamination and to assess the impact of the Ballona Wetlands on coastal ocean waters. In the field samples were tested for temperature, dissolved oxygen, and pH levels using the YSI 600R Sonde Electronic Probe. Further testing was done in the lab using the HACH 2100N Turbidimeter for turbidity levels and IDEXX Quantitray 2000 System with the MPN method for levels of indicator bacteria. A mathematical model was created showing the relationship between dissolved oxygen (dO), turbidity (T), pH, and bacterial growth (EB), where K is the constant of proportionality.

$$[EB] = ke^{[7-pH]}([dO][T])^2$$

K (Total <i>Coliform</i>)	2.00×10^1 MPN·DL/mg ² ·NTU
K (<i>E. Coli</i>)	1.06×10^{-1} MPN·DL/mg ² ·NTU
K (<i>Enterococci</i>)	8.79×10^{-3} MPN·DL/mg ² ·NTU

Results indicated that bacterial levels were higher with increased turbidity and dissolved oxygen in a neutral pH. These results clearly show correlation with increase in suspended solids (increase turbidity) with bacterial levels as can occur with rain storms. Total *Coliform* levels were also higher during the flood tide than the ebb tide seventy percent of the time because flood tides may cause an increase in suspended matter and ebb tides carry bacteria out of the wetlands. This study shows that sophisticated mathematical models can be constructed to greatly simplify the current testing procedures and be more cost-effective. This model will prove critical from an economic point of view and from beach safety considerations

139. ENVIRONMENTAL INFLUENCE ON THE CLONING RATES OF METRIDIDIUM SEA ANEMONES

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The purpose of my experiment is to determine if different external environmental factors, which simulate different natural habitats, affect the reproduction rates of *Metrididium* sea anemones. *Metrididium* sea anemones were chosen since in an aquarium tank they reproduced very fast (probably by cloning) and were happily attached to any surface. My hypothesis was that environment would affect the cloning rates and I wanted to measure the effects of more food (immature brine shrimp), increased circulation, and reduced light. I tested cloning rates with nine tanks having their own water supply; each tank was divided in two with a plastic mesh placed in the middle. One sea anemone was placed in each half tank. Four half tanks received extra feeding, four had double the circulation, and four had reduced lighting. I also had six half tanks with the nominal conditions, meaning they got fed three times a week, had a set circulation, and constant light. I hypothesized that more food would increase cloning rates, that more circulation would increase cloning rates, and that less light would decrease cloning rates. Unfortunately, my results were not statistically significant, perhaps due to experimental difficulties (such as inconsistent water circulation which resulted in dirty tanks, possibly not seeing the anemones, and movement of the anemones). However, my results did show that, on average, dark tanks had more cloning, but extra food tanks and circulation tanks had less growth than the control tanks. I hope to continue this experiment using new techniques to minimize the varying circulation conditions.

140. MODELING THE DISTRIBUTION OF INVASIVE ARGENTINE ANTS IN THE CONTIGUOUS UNITED STATES: EFFECTS OF CLIMATIC FACTORS AND HUMAN HABITATION

G. Y. Williams, Redondo Union High School, Redondo Beach, CA 90277.

The Argentine ant, *Linepithema humile*, is one of the world's most aggressive and damaging invasive species. Due to adverse economic and ecological effects of this species, there is considerable interest in predicting how much further *L. humile* might spread. This study investigated *L. humile*'s physiological and behavioral characteristics, its two modes of dispersal, and the influence of climatic conditions and human disturbance to construct a predictive model using GRASS software, to show areas of potential *L. humile* invasion in the continental U.S. Maps of average annual temperatures, total precipitation, and population by state counties overlaid with known distributions of *L. humile* show that large areas of the Southeast are subject to Argentine invasion as well as any urban site in favorable or unfavorable climate zones.

141. THE EFFECT OF BODY SYMMETRY ON ATHLETIC ABILITY

Nicole Young 5826 Flambeau Rd. Rancho Palos Verdes, CA, 90275

Does body symmetry affect athletic ability? Scientific tests have never proven this to be true, though past studies have correlated symmetry to beauty, survival, and success in breeding. Biology Professor Dr. Jay Phelan has researched human symmetry, and I intend to build on his research and extend it to athletic ability. My hypothesis is that a person with a high degree of body symmetry has more coordination and balance compared to the average person therefore

making them more athletic. This project is designed to test 20 athletic people and 20 non-athletic people and compare the degree of symmetry between the two groups. A precision digital measuring caliper was used to take a total of 32 measurements, (hands, face, knees, ankles, and feet) from the left and right side of each subject. These body parts were chosen because of their equal growth rate on both the right and left sides of the body. Measurements were taken twice and averaged (to reduce measurement errors) and results were used to calculate the symmetry index of each subject. The symmetry index gives a percentage out of 100, 0 being perfectly symmetrical. After adding up the results for the two groups (the non-athletic subjects and athletic subject's) an average index was derived for each group. In conclusion, the results conclusively show body symmetry does have an effect on athletic ability and the higher the degree of body symmetry the more athletic the person.

142. MOTOR DEVELOPMENT IN CHICKEN EMBRYOS

Joanne Siu, Alhambra High School, Mentor: Nina Bradley, USC Keck School of Medicine

Studies of animal behavior and its application to humans such as, using chicken embryos rather than baby's to study the abnormal development during human fetal and neonatal development has been an ever growing interest. Literature has already described the behavior of pre-hatching movements in chicken embryos. However in my project, Motor Development in Chicken Embryos, I use quantitative methods of movement analyses that include motion and muscle activity. I hypothesize that chicken embryos use their beaks, rather than legs to hatch. My hypothesis is base on the theory of Ronald W. Oppenhiem. I placed electromyography electrodes into major muscle of the right wing and leg. EMG and force were recorded on computer and video was taped. I then used computer to measure the EMG activity from leg and wing muscle. I found as a result repetitive movements and came to one of the possible conclusions that chicks may be using leg movements for preparation of hatching. However I don't yet know if they actually use their legs "during" hatching. This project can give researcher new ideas about the significance of leg movements in human fetal development. A better understanding of the biology of embryonic movements can help us to better diagnose medical problems earlier in fetal development.

143. QUANTUM YIELD STUDIES OF SINGLET OXYGEN PRODUCTION BY SQUARE PLANAR COMPLEXES

H. Fong, J. Tang, A. Tran, and M. Selke. California State University, Los Angeles Department of Chemistry and Biochemistry, 5151 State University Drive, Los Angeles, CA 90032

Singlet oxygen, $^1\Delta_g$ of dioxygen, is of great interest to many research groups because of its reactivity with biomolecules including nucleic acids and some amino acids. Our previous research has found that bis-cyclometallated Iridium(III) complexes sensitize the production singlet oxygen in high quantum yields. However, nothing is known whether complexes possessing other metals are also efficient sensitizers. Therefore, the quantum yields of singlet oxygen from a new class of square planar Platinum(II) complexes is of great interest.

The quantum yields of singlet oxygen production and quenching rates of these Platinum(II) complexes are presented. Time-resolved laser spectroscopy was employed in this study. Platinum(II) complexes were excited at 532nm and 355nm wavelengths to generate singlet oxygen. Singlet oxygen decay (luminescence) was detected using a near-infrared luminescence detector and compared with known sensitizer quantum yields to determine the singlet oxygen

quantum yields of the complexes. Quenching rates, i.e. the rates of singlet oxygen deactivation, were also measured using laser spectroscopy.

The quantum yields of singlet oxygen of the Platinum(II) complexes are high (0.9-1.0), and quenching rates are slow. When these high quantum yields are compared to the Iridium(II) analogues it can be concluded that the energy transfer from the excited sensitizer to oxygen does occur at the metal center. In all, we have an excellent new class of singlet oxygen sensitizers. Our findings add to the current understanding of metal-centered sensitizers and will provide researchers with a blueprint for the synthesis of new sensitizers for photodynamic therapy.

144. ACCESSING THE EFFECTS OF SLEEP DEPRIVATION IN A LONG LIVED *DROSOPHILA MELANOGASTER* LINE

Anum Sheikh: California Institute of Technology, Benzer Lab, Department of Biology Pasadena, CA

Aging is a process of numerous detrimental changes that are progressive and universal and occur in a variety of biological molecules. Thus, I investigated if there is a relationship between sleep deprivation and lifespan in *Drosophila*. Despite the importance of sleep in our lives and our inability to get enough of it, sleep remains a mystery to researchers. It was recently established that *Drosophila melanogaster* rest has sleep-like behavioral features, including prolonged immobility and preferred resting position. Furthermore, I manually sleep deprived the flies to examine the amount of activity delivered by each. Consequently, I looked at the activity rebound of a long-lived line and its control (the fly line 1064/109 is the long-lived line and 1064/w and 109/w are the controls). Hence, experiment one was performed to analyze the sleep-activity cycles (using the Trikinetics Activity Monitor), where the flies were raised on different levels of nutrients; experiment two used flies raised on different levels of nutrients from experiment one and then further sleep depriving them to determine average activity and finally those flies were used to set up a lifespan analysis in the end. An average of 800 readings were taken by using three different fly strains by the Trikinetics Activity Monitor over a period of three days. It is assumed that one reading was taken every 45 minutes. All five strains exhibit the same period—two of them look nearly identical, while the other strain exhibits, an average, a higher level of activity.

145. ACTIVITIES CHARACTERISTIC OF *DROSOPHILA* LONGEVITY MUTANTS 1101, 1130, AND 2456

Anna Lam, Alhambra High School, Mentor: Dr. Horng-Dar Wang, California Institute of Technology

Longevity mutants were confirmed by selective breeding, successful in combining longevity with stress-resistance. By studying these mutants' behavior through different tests, aspects of human aging conditions can become much clearer. Last year's project incorporated the use of microarray analysis to find comparisons and differences of the mutants' genomes in search of biological pathways of the fly's longevity. A more specific approach analyzes the flies' average levels of activity, weight, and metabolism. Negative geotaxis tests revealed a rise in activity levels of longevity mutants compared to that of the wild type. Longevity mutants were also heavier compared to wild types. Even more significant results showed a higher metabolism rate in longevity flies. All results showed a higher possibility of vigor in these longevity mutants, especially inferring a conflicting view to the established theory that organisms with lower metabolism rates live longer. Knowing the characteristics of longevity mutant behavior may shed light on the physical possibilities for human longevity.

146. PROBLEMS WITH *PISTA* IN THE NORTHEAST PACIFIC (ANNELIDA:
POLYCHAETA: TEREBELLIDAE)

L.H. Harris, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007

Identification of species in the genera *Pista* Malmgren, 1866, and *Betapista* Banse, 1980, in the northeast Pacific has been problematical despite recent revisions. Type material, specimens cited in original descriptions, and supplemental specimens have been reviewed to resolve this situation. The genus *Betapista* belongs to the subgroup of *Pista* species with multiple nephridia in the thorax and enlarged anterior neurohooks. Members of *Pista sensu strictu* have 2 pairs of thoracic nephridia and neurohooks of equal size throughout the thorax. *Betapista* is redefined, and *P. elongata* Moore, 1909, *P. moorei* Berkeley & Berkeley 1942, and *P. pacifica* Berkeley & Berkeley, 1942, are moved into this genus. A complex of morphologically similar species along this coast includes *Pista agassizi* Hilbig, 2000, and two new species. *P. percyi* Hilbig, 2000 is considered to be a junior synonym of *P. agassizi*.

<u>Name</u>	<u>Abstract</u>	<u>day</u>	<u>Session</u>	<u>Award Category</u>
Douglas E. Morgan	11	Friday	Reish symp	
Andrea Murray	105	Saturday	Archaeology	
Imelda Nava	84a	Friday	molecular ecology	fisheries
Matt Nielson	85	Saturday	mol ecol	ecol/evo
Gregory Nishiyama	117	Saturday	Contributed Papers	
Dorothy Norris	8	Friday	Reish Symp.	
Torrey Nyborg	21	Friday	paleontology	
Su F. Ong	131	Saturday	rtp	
Stephen O'Neil	112	Saturday	Archaeology	
Ed Parnell	28	Friday	reef ecol	
Ivan Phillipsen	77	Saturday	molecular ecology	eco/evo
Daniel J. Pondella II	34	Friday	reef ecol	
Yvette Ralph	43	Friday	Contributed Papers	eco/evo
Kesler A. Randall	18	Friday	paleontology	
Don Reish	16	Friday	Reish Symp.	
Jesus A Reyes	93	Saturday	Fish stress	fisheries
Veronica Rodriguez-Villanueva	69	Friday	poster	eco/evo
Mark Roeder	22	Friday	paleontology	
Carlos R. Rosales	103	Saturday	molelular biology	
Matthew P. Salomon	118	Saturday	Contributed Papers	fisheries
Brett F. Sanders	41	Friday	Env. Modelling	
Kenneth Schiff	6	Friday	Reish Symp.	
Eric Scott	24	Friday	paleontology	
Chris Shaw	23	Friday	paleontology	
Anum Sheikh	144	Saturday	rtp	
Romeo Sison	70	Friday	poster	eco/evo
Joanne Siu	142	Saturday	rtp	
Gregory Skomal	97	Saturday	Fish stress	
Sally J. Smith	71	Friday	poster	eco/evo
Michelle Stabio	72	Friday	poster	eco/evo
Mark Steele	33	Friday	Reef ecology	
Ivan H. Strudwick	106	Saturday	Archaeology	
Johanna Tang	143	Saturday	rtp with Fong	
Connie Tat	128	Saturday	rtp	
Stephen F. Theberge	98	Saturday	Fish Stress	
Darin Topping	26	Friday	Reef ecology	
Elizabeth Torres	83	Saturday	molecular ecology	
Allen Tran	143	Saturday	rtp with Fong	
Timothy Uy	134	Saturday	rtp	
Travis Vail	78	Saturday	molecular ecology	
Hugh M. Wagner	17	Friday	paleontology	
George Walker	73	Friday	poster	mol bio
Genevieve Williams	140	Saturday	rtp	
Ray Wilson	86	Saturday	molecular ecology	
Jack Q. Word	10	Friday	Reish Symp.	
Swati Yanamadala	138	Saturday	rtp	
Stephanie Yelenik	74	Friday	poster	
John Young	127	Saturday	rtp	
Nicole Young	141	Saturday	rtp	
Janey Yu	129	Saturday	rtp	
Robin Zhou	130	Saturday	rtp	

<u>Name</u>	<u>Abstract</u>	<u>day</u>	<u>Session</u>	<u>Award Category</u>
Maelanie M. Galima	91	Saturday	Fish stress	
Victor Galvan	62	Friday	poster	eco/evo
Editte Gharakhanian	101	Saturday	molecular biology	
Lisa Gilbane	114	Saturday	Contributed Papers	eco evo
Julie Gov	120	Saturday	rtp	
K.D. Green	7	Friday	Reish Symp.	
Amy Groce	63	Friday	poster	
Amy Groce	68	Friday	poster	
Robert S. Grove	30	Friday	Reef ecology	
Kristen Gruenthal	80	Saturday	molecular ecology	eco/evo
Sherry Gust	19	Friday	paleontology	
Sherry Gust	104	Saturday	archeology	
Sandy Ha	124	Saturday	rtp	
Brittany Hahn	125	Saturday	rtp	
Lori Hale	115	Saturday	Contributed papers	Fisheries
Angelique C. Hamane	45	Friday	Contributed papers	
Todd Haney	81	Saturday	molecular ecology	
L. H. Harris	146	friday	Reish symposia	
Mark Harris	64	Friday	poster	eco/evo
Thomas H. Hatch	65	Friday	poster	mol. Bio
Cheryl Hogue	38	Friday	Env. Modelling	
Lawrence Honma	32	Friday	Reef Ecology	
Jasmin Hu	126	Saturday	rtp	
Losmeiya Huang	133	Saturday	rtp	
Susie Huber	47	Friday	Contributed papers	physical science
Andrew Jahn	48	Friday	Contributed papers	
Steven R. James	113	Saturday	Archaeology	
Kim Johnson	49	Friday	Contributed papers	fisheries
Sanyl Kabre	136	Saturday	rtp	
Julianne Kalman	92	Saturday	Fish stress	fisheries bio
Kevin M. Kelley	88	Saturday	Fish stress	
Kevin M. Kelley	89	Saturday	Fish stress	
Kelly Kim	51	Friday	Contributed Papers	
Scott Kimura	28a	Friday	rocky reefs	
Anna Lam	145	Saturday	rtp	
Natalie Lawson	111	Saturday	Archaeology	
Joon-Bok Lee	137	Saturday	rtp	
Serena Lee	121	Saturday	rtp	
Jeong Hee Lim	50	Friday	Contributed Papers	physical Science
Josh Lindsay	36	Saturday	Contributed Papers	fisheries bio
John C. Ljubenkov	12	Friday	Reish Symp.	
Larry Lovell	66	Friday	poster	
Christopher Lowe	94	Saturday	fish stress	
Crystal Marquez	75	Friday	poster	
Kevin McCully	139	Saturday	rtp	
Michael McDaniels	135	Saturday	rtp	
Alan Mearns	1	Friday	Reish symposia	
Alan Mearns	28b	Friday	Reef ecology	
Samir Mehrotra	131a	Saturday	rtp	
Eric Miller	116	Saturday	Contributed Papers	eco/evo

ALPHABETICAL LIST OF ALL PRESENTERS

<u>Name</u>	<u>Abstract</u>	<u>day</u>	<u>Session</u>	<u>Award Category</u>
Scott Aalbers	95	Saturday	Fish stress	
Elizabeth Abeja	52	Friday	poster	physical Science
Maham Ahmad	122	Saturday	rtp	
M. James Allen	4	Friday	Reish symp	
Cami Jo Anderson	53	Friday	poster	physical Science
Diana L. Andres	54	Friday	poster	eco/evo
James W. Archie	76	Saturday	molecular ecology	
Lisa C. Babilonia	25	Saturday	Paleontology	
Michael Baker	90	Saturday	Fish stress	
Margaret Banda	55	Friday	poster	physical Science
D. Barter	107	Saturday	Archaeology	
Steve Bay	9	Friday	Reish symp	
Adrienne Beck	87	Saturday	molecular ecology	
Ed Beighley	39	Friday	Env. Modelling	physical Science
F.M. Bell	56	Friday	poster	eco/evo
Tom Benson	57	Friday	poster	eco/evo
Diego Bernal	96	Saturday	Fish stress	
Samuel Bernier	15	Friday	Reish symo	eco/evo
Gorjana Bezmalinovic	100	Saturday	molecular biology	mol bio
James A. Blake	3	Friday	reish symp	
Judy Brusslan	99	Saturday	moiecular biology	
Steve Carter	40	Friday	Env. Modelling	
J.E. Caselle	35	Friday	Reef ecology	
Dorothy Chan	123	Saturday	rtp	
Gloria Chi	119	Saturday	rtp	
Ved Chirayath	132	Saturday	rtp	
Linden Clarke	42	Friday	Env. Modelling	
J.,R. Cobb	37	Friday	Reef ecology	
Mike Curtis	29	Friday	Reef ecology	
Colleen Delaney-Rivera	108	Saturday	Archaeology	
Victor Marcelo Delgado	58	Friday	poster	eco/evo
Margie DeRose	59	Friday	poster	physical science
Larry Deysher	31	Friday	Reef ecology	
Victoria Diaz-Castañeda	13	Friday	Reish Symposia	
John Dorsey	14	Friday	Reish Symposia	
Suzanne Edmands	79	Saturday	molecular ecology	
Christopher Ellison	84	Saturday	molecular ecology	eco/evo
Sergio Escorza-Treviño	82	Saturday	molecular ecology	
Kristian Fauchald	2	Friday	Reish Symposia	
David Ferraro	110	Saturday	Archaeology	
Lanny H. Fisk	20	Friday	paleontology	
Kerry Flaherty	60	Friday	poster	eco/evo
Henry Fong	143	Saturday	rtp	
Alicia M. Fox	44	Friday	Contributed Papers	eco/evo
John Froeschke	27	Friday	Reef ecology	fisheries
Christopher Frost	67	Friday	poster	
Jerome Gaeta	109	Saturday	Archaeology	
Elsa M. Gallardo	61	Friday	poster	mol bio