



# CALIFORNIA

2000 ANNUAL MEETING

at USC

MAY 19-20, 2000

SOUTHERN  
ACADEMY OF SCIENCES

PROGRAM  
&  
ABSTRACTS



SOUTHERN



SOUTHERN CALIFORNIA  
ACADEMY OF SCIENCES  
ANNUAL MEETING, 19,20 MAY 2000  
University of Southern California

Dear Colleagues,

On behalf of the Southern California Academy of Sciences (SCAS) Board of Directors and our sponsoring, endorsing, invited, and supporting organizations, I invite you to join us for our Annual Meeting at the University of Southern California on May 19 and 20, 2000.

Attending the 2000 SCAS Annual Meeting will help you stay current with the advances that are coming out of some of the fascinating areas of the Southern California scientific community. This year's presentations highlight some rather diverse and interesting fields. There are symposia covering: **Coastal Habitat Restoration; Lichens; Research at Public Aquaria; The Ecology of Kelp Beds off Southern California; Understanding the Urban Influences on Santa Monica Bay; New and Rare Species to California During the 1997-98 El Niño; The Los Angeles River, Discharges, Fates and Effects; Ecology of Southern California Riparian Systems; and Potential for Ecological Restoration of the Los Angeles River.** In addition, we feature three sessions of contributed papers, a poster session, and a display of the Southern California Chapter of the Guild of Natural Science Illustrators at the Friday evening Wine and Cheese Reception, and an all-day session of the Southern California Junior Academy of Sciences.

Highlighting this year's SCAS Annual Meeting will be:

A Friday address: **Kelp Beds of San Diego, Orange and Los Angeles Counties; Past, Present and Future Considerations** by Wheeler North, California Institute of Technology, and

A Saturday address: **Storm Water: Asset not Liability** by Dorothy Green, President, Los Angeles and San Gabriel Rivers Watershed Council.

This marks the 109th year that the Southern California Academy of Sciences has played an important part in the field of science of Southern California. From the onset of the Academy, meetings and the exchange of information, has been one of the Academy's focuses. We take great pride in presenting you with the 2000 Annual Meeting. We hope you will find it educational as well as entertaining and we look forward to visiting with you while you are here.

Sincerely

A handwritten signature in black ink that reads "David G. Huckaby". The signature is written in a cursive style with a large, looping 'y' at the end.

David G. Huckaby  
Academy Board President

# SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

## ANNUAL MEETING

MAY 19 - MAY 20, 2000

UNIVERSITY OF SOUTHERN CALIFORNIA



### SCAS BOARD MEMBERS

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### SCAS 2000 Annual Meeting Committee

Dr. Hans Bozler	Dr. Daniel Guthrie
Dr. Kathryn Dickinson	Dr. John Roberts
Dr. Donn Gorsline	Dr. Russell Zimmer

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## GENERAL INFORMATION

### Registration

On-site registration will be available in the patio of the Stauffer Lecture Halls (SLH) throughout the meeting, beginning at 8:00 am each day.

### Coffee and Refreshments

Coffee breaks have been arranged for morning and afternoon in the SLH Patio for participants.

### Lunch Spots

The Commons Cafeteria in the Student Union will be open during the meeting. There is every fast food franchise known to human kind along Figueroa on the east side of the campus and there is a cafeteria in the State Museum in Exposition Park south of the campus.

### Poster Session and Reception

The poster session and wine & cheese reception will be held Friday evening from 5:00 to 7:00 pm in the upstairs Commons Restaurant in the Student Union. There will also be a display of Science Illustrations by the Guild of Science Illustrators, Southern California Chapter in the same room.

### Slide Previewing Area

A carousel projector and overhead projector will be available in Science Hall 123 near the meeting area. Participants are urged to bring their own carousel trays. Computer projectors are available in the SLH lecture halls and in SAL 101 but not in OHE 122. Be sure to have back-up projection material in case there are equipment failures. Projection can be tested before sessions, during coffee breaks, at lunch and immediately after the Friday afternoon sessions.

### Program

Papers are numbered in order of the abstracts. There is an Epitome to provide an overview of the sessions. An index of first authors can be found after the abstracts. Student papers eligible for award review are indicated by an asterisk. The Junior Academy program will be on Saturday in SLH 100. The Junior Academy program and abstracts appear in a separate book.

## ACKNOWLEDGEMENTS

The 2000 Annual Meeting of the Southern California Academy of Sciences is jointly sponsored by the University of Southern California, the Wrigley Institute for Environmental Studies and the USC Sea Grant Program.

The Los Angeles County Museum of Natural History provides SCAS with space and has provided free admission to the museum during the meeting for SCAS meeting badge holders.

The American Institute of Fisheries Biologists is again providing a certificate and financial award to the best student paper in the general area of fisheries biology. For more information see the following page. Dr. Michael Hinton, the current District Director, and his fellow officers have arranged for the judging of the student papers.

As always, the SCAS Board Members have given service, advice and labor to the meeting in support of the local committee. They assist with registration, organizing symposia, and the variety of tasks necessary to put on the annual meeting.

Special thanks are due to the following people who, in effect, were part of the primary "local" committee:

Dr. Kathryn Dickson, Poster Session Chair and Organizer;

Dr. John Roberts, Contributed Papers Sessions Organizer and Chair;

Dr. Daniel Guthrie, Registration Chair;

Gloria Takahashi, Junior Academy Program Organizer;

Dr. Jonathan Baskin, Gifts and Development Chair;

Dr. Robert Phalen, Awards Chair.

Symposium Organizers and Chairs: James Allen, Ralph Appy, Steven Bay, Elizabeth Braker, Robert Grove, Tina Hartney, Susanne Lawrenz-Miller, Homa Lee, Judy Lemus, David Magney, Daniel Pondella.

Session Chairs: Kathryn Dickson, Masahiro Dojiri, Linda Ritterbush, John Roberts, Martha Schwartz, Richard Schwartz.

We also appreciate the assistance of staff and students at USC who provided logistical help, services and session monitoring. We particularly thank Lisa Swanson who assisted with the editing and publication of the Program.

## EPITOME

	Friday Morning	Plenary Talk	Friday Afternoon
OHE 122	Coastal Habitat Restoration		Coastal Habitat Restoration
SLH 100	Terrestrial Studies/Physical Sciences		Research at Public Aquaria
SLH 200	Ecology of Kelp Beds of Southern California	Wheeler North, Prof. Emeritus, Caltech	Ecology of Kelp Beds of Southern California
SLH 102	Urban Influences on Santa Monica Bay		Urban Influences on Santa Monica Bay

	Friday evening
Commons Restaurant	Poster Session/, Wine and Cheese Reception

	Saturday Morning Morning	Saturday Plenary Talk	Saturday Afternoon
SLH 102	New and Rare Species to California During the 1997 - 98 El Niño		New and Rare Species to California During the 1997 - 98 El Niño
OHE 122	The Los Angeles River: Discharges, Fates, and Effects		Ecology of Southern California Riparian Systems
SLH 200	Fish: Contributed Papers	Dorothy Green, President, Los Angeles and San Gabriel Rivers Watershed Council	Marine and Coastal Ecology; Water Quality
SAL 101	Lichen Symposium		
SLH 100	Junior Academy of Sciences		Junior Academy of Sciences

## SCAS 2000 SESSION PROGRAMS

SLH= Stauffer Lecture Halls; OHE= Olin Hall; SAL= Salvatori Hall

### FRIDAY OHE 122

#### MORNING

SYMPOSIUM: COASTAL HABITAT RESTORATION

CHAIR: Dr. Ralph Appy, Port of Los Angeles

Time	No.	Paper
9:10 - 9:20		INTRODUCTION. R. Appy, Port of Los Angeles.
9:20 - 9:40	1	COASTAL WETLANDS RESTORATION PROJECT PLANNING. <u>D.G. Cannon</u> . Everest International Consultants, Inc.
9:40 - 10:00	2	THE USE OF NUMERICAL MODELS IN WETLAND PLANNING AND DESIGN. <u>Y.K. Poon</u> . Everest International Consultants, Inc.
10:00 - 10:20	3	LAGOON TIDAL RESPONSE TO INLET CHANNEL VARIATION. <u>S. Jenkins</u> . Scripps Institute of Oceanography.
10:20 - 10:40	4	FLOOD TIDE DELTA FORMATION, EVOLUTION, AND INFLUENCE WITHIN RESTORED TIDAL WETLAND SYSTEMS. <u>K. W. Merkel</u> . Merkel & Associates, Inc.
10:40 - 11:00		BREAK
11:00 - 12:00		PLENARY SESSION, SLH 200

#### AFTERNOON

SYMPOSIUM: COASTAL HABITAT RESTORATION

CHAIR: Dr. Ralph Appy, Port of Los Angeles

Time	No.	Paper
1:20-1:40	5	VALUE OF COASTAL SALT MARSH HABITATS TO GROWTH OF THE CALIFORNIA KILLIFISH, <i>Fundulus parvipinnis</i> : A BIOENERGETICS MODELLING EVALUATION. <u>S.P. Madon</u> , G.D. Williams, J.M. Wets & J.B. Zedler. PERL, CSUSD; Botany Dept., UW.
1:40 - 2:00	6	HABITAT GOALS FOR SAN FRANCISCO BAY AND THEIR PRACTICAL APPLICATION. <u>M. Josselyn</u> . Research Associates, Inc

- 2:00 - 2:20      7      CORDGRASS (*Spartina foliosa*) EXPANSION ONTO INTERTIDAL MUDFLATS AT TIJUANA ESTUARY - PREDICTIONS FROM A SIMULATION MODEL AND IMPLICATIONS FOR RESTORATION. K.M. Ward, D.H. Deutschman, J.C. Callaway & J.B. Zedler. PERL; Dept. of Biology, CSUSD; Dept. Env. Sci, USF; Botany Dept, UW.
- 2:20 - 2:40      8      INTEGRATING SPATIAL AND TEMPORAL VARIABILITY INTO FISH DIET ANALYSES PROVIDES A BETTER UNDERSTANDING OF THE TIJUANA ESTUARY FOOD WEB. G.D. Williams, J.M. West, S. Madon & J.B. Zedler. PERL, UCUSD; Botany Dept., UW.
- 2:40 - 3:00      9      THE DESIGN AND RESEARCH PLAN OF THE MODEL MARSH IN CONTRIBUTING TO RESTORATION ECOLOGY. J.M. Lessmann, S.P. Madon and J.B. Zedler. PERL, CSUSD; Botany Dept.,UW.
- 3:00 - 3:20      BREAK
- 3:20 - 3:40      10      VALUE OF SHALLOW WATER HABITAT CREATED IN THE OUTER LOS ANGELES HARBOR. K. Green, R.G. Appy. MEC Analytical Systems, Inc. & Port of Los Angeles
- 3:40 - 4:00      11      RELOCATION OF A LARGE BLACK-CROWNED NIGHT HERON COLONY IN SOUTHERN CALIFORNIA. S. Crouch, Port of Long Beach.
- 4:00 - 4:20      12      INCREASE IN THE CALIFORNIA LEAST TERN POPULATION AT LOS ANGELES HARBOR IN RESPONSE TO NEWLY-CREATED DREDGE FILL HABITAT. K. Keane. Keane Biological Consulting.
- 4:20 - 4:50      [Discussion]
- 5:00 - 7:00      POSTER SESSION/ RECEPTION (Commons Restaurant)

**FRIDAY SLH 100****MORNING**

SESSION: TERRESTRIAL STUDIES; PHYSICAL SCIENCES

CHAIR: Dr. Linda Ritterbush, Department of Geology, California Luthem University

Time	No.	Paper
8:20 – 8:40	13	*SYNTHESIS AND PHOTOOXIDATION OF GOLD (I) TRIPHENYLPHOSPHINE PHENYLTHIOLATE <u>K. Lee</u> , H. Symon, California State University Los Angeles, Los Angeles, CA, 90032-8531
8:40 - 9:00	14	*HEPATOCYTE-SPECIFIC MUTATION ESTABLISHES RXRa AS A HETERODIMERIC INTEGRATOR OF MULTIPLE PHYSIOLOGICAL PROCESSES IN THE LIVER. <u>Georgette Enriquez</u> , Henry Sucov, Institute of Genetic Medicine
9:00 - 9:20	15	*MODE OF MAJOR HISTOCOMPATIBILITY COMPLEX EVOLUTION IN THE GREENBULS (AVES:PYCNONOTIDAE). <u>A. Aguilar</u> and R. K. Wayne, UCLA
9:20 - 9:40	16	ELEPHANTOXENE CILIATED EUKARYOTE MICROBES, THE CALIFORNIA OBSERVATIONS. <u>T. P. Smith</u> , K. Jollie, and J. L. Mohr, USC
9:40 - 10:00	17	*DIFFERENCES IN VEGETATION AND TOPOGRAPHY BETWEEN AREAS OF HIGH AND LOW CALIFORNIA GNATCATCHER DENSITIES. <u>T. L. Mashikian</u> , CSU Fullerton
10:00 - 10:20	18	*A FIELD INVESTIGATION OF THE CLARK MOUNTAIN FAULT COMPLEX, SAN BERNARDINO COUNTY, CALIFORNIA. <u>S. M. Baltzer</u> and M. Waki, Cal. Poly. Pomona
10:20 - 10:40	19	MODERN ANALOGUES FOR SIZE CLINES IN AGNOSTID TRILOBITES. <u>L. Ritterbush</u> , California Lutheran University
10:40 – 11:00		BREAK
11:00 - 12:00		PLENARY SESSION SLH 200

\* Indicates student competing for an award

## AFTERNOON

SYMPOSIUM: RESEARCH AT PUBLIC AQUARIUMS

CHAIRS: Judy Lemus, USC Sea Grant and Susanne Miller, Cabrillo Marine Aquarium

Time	No.	Paper
1:20-2:00	20	CONSERVATION ACTIVITIES OF AQUARIUMS IN NORTH AMERICA. <u>J. Nightingale</u> , The Vancouver Aquarium
2:00 - 2:20	21	TERM MARINE POPULATION STUDIES BY CABRILLO MARINE AQUARIUM. <u>S. Lawrenz Miller</u> , Cabrillo Marine Aquarium
2:20 - 2:40	22	PRELIMINARY NOTES ON THE CAPTIVE SPAWNING AND REARING OF Stereolepis Gigas, THE GIANT SEA BASS, AT THE LONG BEACH AQUARIUM OF THE PACIFIC <u>M. Ankley</u> , Long Beach Aquarium of the Pacific
2:40 - 3:00	23	CORAL SPAWNING AT THE BIRCH AQUARIUM AT SCRIPPS <u>F. Nosratpour</u> , Birch Aquarium at Scripps
3:00 - 3:20		BREAK
3:20 - 3:40	24	GROWING YOUNG SEA ANIMALS AND YOUNG SCIENTISTS AT THE CABRILLO MARINE AQUARIUM <u>M. Schaadt</u> , Cabrillo Marine Aquarium
3:40 - 4:00	25	EFFECTIVE REMOVAL OF CARBON DIOXIDE IN AN ANCHOVY (Engraulis mordax) EXHIBIT AT THE AQUARIUM OF THE PACIFIC <u>N. Lightowler Caruso</u> , Long Beach Aquarium of the Pacific
4:00 - 4:20	26	THE DESIGN AND EFFECTIVENESS OF AN ALGAL SCRUBBER ON A TEMPERATE CLOSED-SYSTEM MARINE AQUARIUM <u>S.E. Blair</u> , Long Beach Aquarium of the Pacific
4:20 - 4:40	27	MONITORING THE REPRODUCTIVE STATUS OF SEA OTTERS (Enhydra lutris) <u>S. E. Larson</u> , The Seattle Aquarium
4:40 - 5:00		[Discussion]
5:00 - 7:00		POSTER SESSION/RECEPTION (Commons Restaurant)

**FRIDAY SLH 200****MORNING**

**SYMPOSIUM:** THE ECOLOGY OF KELP BEDS OF SOUTHERN CALIFORNIA

**CHAIRS:** Dan Pondella, UCLA and Vantuna Research Group; Robert Grove, Southern California Edison

Time	No.	Paper
8:50 - 9:00		WELCOME AND INTRODUCTION. <u>D. Pondella</u> and <u>R. Grove</u>
9:00 - 9:20	28	KELP BED FISH: EFFECT OF A THERMAL EFFLUENT. <u>M.L. Patton</u> . Rainbow Environmental Services.
9:20 - 9:40	29	PERMITTING AND CONSTRUCTION OF A KELP MITIGATION ARTIFICIAL REEF. <u>R.S. Grove</u> , H. Elwany. Southern California Edison. Coastal Environments.
9:40 - 10:00	30	KELP TRANSPLANTATION IN THE SOUTHERN CALIFORNIA EDISON EXPERIMENTAL KELP REEF PROJECT. <u>L. Deysher</u> and T.A. Dean. Coastal Resources Associates.
10:00 - 10:20	31	RESTORATION OF KELP BEDS. <u>D. J. Pondella, II</u> . UCLA and Vantuna Research Group.
10:20 - 10:40	32	FISHES OF THE PALOS VERDES PENINSULA KELP BEDS: 1974-2000 <u>J. S. Stephens, Jr.</u> and D. J. Pondella, II. Vantuna Research Group.
10:40 - 11:00		BREAK
11:00 - 12:00	33	PLENARY SESSION/KEYNOTE TALK: KELP BEDS OF SAN DIEGO, ORANGE, AND LOS ANGELES COUNTIES; PAST, PRESENT AND FUTURE CONSIDERATIONS. <u>Wheeler J. North</u> , California Institute of Technology.

**AFTERNOON**

**SYMPOSIUM:** THE ECOLOGY OF KELP BEDS OF SOUTHERN CALIFORNIA

**CHAIRS:** Dan Pondella, UCLA and Vantuna Research Group; Robert Grove, Southern California Edison

Time	No.	Paper
1:20-1:40	34	AN OVERVIEW OF THE KELP BEDS OF ORANGE AND SAN DIEGO COUNTIES IN 1999 (WITH A REVIEW OF THE KELP BEDS FROM 1983 TO 1998). <u>M. D. Curtis</u> . MBC.
1:40 - 2:00	35	PATTERNS AND CONSEQUENCES OF SPORE DISPERSAL IN GIANT KELP, <i>MACROCYSTIS PYRIFERA</i> . <u>Reed, D. C.</u> <sup>1</sup> , Raimondi, P. T. <sup>2</sup> and Washburn L. <sup>1</sup> . <sup>1</sup> UCSB, <sup>2</sup> UCSC.
2:00 - 2:20	36	*EL NINO 1997-98: LARGE-SCALE PATTERNS OF DISTURBANCE AND RECOVERY IN GIANT KELP FORESTS. <u>M. S. Edwards</u> . UCSC.



- 2:20 - 2:40 37 DISPERSAL PROCESSES, LOCAL HABITAT FEATURES, AND PATTERNS OF NEARSHORE REEF FISH ASSEMBLAGES WITHIN THE CALIFORNIA BIOGEOGRAPHIC PROVINCE. D.M. Schroeder. UCSB.
- 2:40 - 3:00 38 THE NEARSHORE FISH ASSEMBLAGE OF SANTA CATALINA ISLAND. D. J. Pondella, II<sup>1</sup> and L. G. Allen<sup>2</sup>. <sup>1</sup>VRG, <sup>2</sup>NMFRP.
- 3:00 - 3:20 BREAK
- 3:20 - 3:40 39 EL NINO, 1997-1998: SOME THOUGHTS ON KELPS AND GRAZERS. M. Tegner. Scripps Institution of Oceanography.
- 3:40 - 4:00 40 BIOGEOGRAPHICS AND ECOLOGICAL IMPLICATIONS OF KELP BED RAFTING AS A DISPERSAL VECTOR FOR MARINE INVERTEBRATES. W. W. Bushing. SEER, Santa Catalina Island Conservancy.
- 4:00 - 4:20 41 ASSESSING THE EFFECTS OF DIVE FISHING ON EXPLOITED POPULATIONS OF MARINE INVERTEBRATES USING LONG-TERM MONITORING DATA COLLECTED IN PROTECTED AND NONPROTECTED AREAS IN SOUTHERN CALIFORNIA. S. Schroeter<sup>1</sup>, D. Reed<sup>1</sup>, J. Estes<sup>2</sup>, and D. Kushner<sup>3</sup>, <sup>1</sup>UCSB, <sup>2</sup>USGS, <sup>3</sup>National Park Service.
- 4:20 - 4:40 42 ASPECTS OF THE ECOLOGY OF WHITE ABALONE, *HALIOTIS SORENSENI*. D. V. Richards<sup>1</sup> and P. L. Haaker<sup>2</sup> <sup>1</sup>Channel Islands National Park, <sup>2</sup>California Department of Fish and Game
- 4:40 - 5:00 43 DO SOUTHERN CALIFORNIA HARVEST REFUGIA ENHANCE TARGET FISH POPULATIONS? Beers, I. T., Ambrose, R. F., University of California, Los Angeles, CA 90025
- 5:00 - 7:00 POSTER SESSION/RECEPTION (Commons Restaurant)

\* Indicates student competing for an award

**FRIDAY SLH 102****MORNING**

**SYMPOSIUM:** UNDERSTANDING THE URBAN INFLUENCE ON SANTA MONICA BAY

**CHAIR:** Homa J. Lee, U.S. Geological Survey

Time	No.	Paper
8:40 - 9:00	44	UNDERSTANDING THE URBAN INFLUENCE ON SANTA MONICA BAY: AN OVERVIEW. <u>S. B. Weisberg</u> <sup>1</sup> , M. Yamaguchi <sup>2</sup> , M. Dojiri <sup>3</sup> , and H. J. Lee <sup>4</sup> , <sup>1</sup> Southern California Coastal Water Research Project, <sup>2</sup> Santa Monica Bay Restoration Project, <sup>3</sup> City of Los Angeles, <sup>4</sup> U.S. Geological Survey
9:00 -	45	SUBMARINE GEOMORPHOLOGY OF SANTA MONICA BAY FROM MULTIBEAM MAPPING. <u>J. V. Gardner</u> and P. Dartnell, U.S. Geological Survey (Read by Title)
9:00 - 9:20	46	COASTAL OCEANOGRAPHIC CONTROLS ON SPATIAL AND TEMPORAL VARIATIONS IN HOLOCENE SEDIMENT ACCUMULATION, SANTA MONICA BAY. <u>C. K. Sommerfield</u> <sup>1</sup> , H. J. Lee <sup>2</sup> , and C. R. Alexander <sup>3</sup> , <sup>1</sup> Woods Hole Oceanographic Institution, <sup>2</sup> U.S. Geological Survey, <sup>3</sup> Skidaway Institute of Oceanography
9:20 - 9:40	47	DISPERSAL AND ACCUMULATION OF MODERN SEDIMENTS ON THE SANTA MONICA SHELF AND SLOPE. <u>C. Alexander</u> <sup>1</sup> , C. Sommerfield <sup>2</sup> , and H. Lee <sup>3</sup> , <sup>1</sup> Skidaway Institute of Oceanography, <sup>2</sup> Woods Hole Oceanographic Institution, <sup>3</sup> U.S. Geological Survey
9:40 - 10:00	48	BENTHIC INFAUNAL BIOTURBATION EFFECTS ON SEDIMENT MIXING RATES IN SANTA MONICA BAY, CALIFORNIA. <u>J. A. Ranasinghe</u> <sup>1</sup> , C. Alexander <sup>2</sup> , and T. Phillips <sup>3</sup> , <sup>1</sup> Southern California Coastal Water Research Project, <sup>2</sup> Skidaway Institute of Oceanography, <sup>3</sup> City of Los Angeles
10:00 - 10:20	49	CHARACTERIZING BENTHIC HABITATS OF SANTA MONICA BAY BY BOTTOM PHOTOGRAPHY. <u>B. Edwards</u> , U.S. Geological Survey
10:20 - 10:40	50	SPATIAL DISTRIBUTION OF SURFICIAL GRAIN SIZE. <u>M. Leecaster</u> , Southern California Coastal Water Research Project
10:40 - 11:00		BREAK
11:00 - 12:00		PLENARY SESSION SLH 200

**AFTERNOON**

**SYMPOSIUM:** UNDERSTANDING THE URBAN INFLUENCE ON SANTA MONICA BAY

**CHAIRS:** Masahiro Dojiri, City of Los Angeles and Steven Bay, Southern California Coastal Water Research Project

Time                      No.    Paper

- 1:20-1:40 51 TEMPORAL AND SPATIAL DISTRIBUTIONS OF ORGANIC POLLUTANTS AND TRACE METALS IN SEDIMENTS OF SANTA MONICA BAY, CALIFORNIA. E. Zeng, Southern California Coastal Water Research Project
- 1:40 - 2:00 52 TOXICITY OF SEDIMENT CORES FROM SANTA MONICA BAY. S. Bay<sup>1</sup>, D. Greenstein<sup>1</sup>, A. Jirik<sup>1</sup>, J. Brown<sup>1</sup>, and C. Alexander<sup>2</sup>, <sup>1</sup>Southern California Coastal Water Research Project, <sup>2</sup>Skidaway Institute of Oceanography
- 2:00 - 2:20 53 FORAMINIFERAL RESPONSE TO POLLUTION AND ABATEMENT IN SANTA MONICA BAY, CALIFORNIA. M. McGann, U.S. Geological Survey
- 2:20 - 2:40 54 BENTHIC INFAUNAL ASSEMBLAGES OF SANTA MONICA BAY IN RELATION TO HABITAT CHARACTERISTICS: A STUDY USING TWO ANALYTICAL TECHNIQUES. A. Dalkey<sup>1</sup>, G. B. Deets<sup>1</sup>, A. Ranasinghe<sup>2</sup>, and M. Dojiri<sup>1</sup>, <sup>1</sup>City of Los Angeles, <sup>2</sup>Southern California Coastal Water Research Project
- 2:40 - 3:00 55 RESPONSE OF HUMAN CELLS (EPA METHOD 4425) TO EXTRACTS OF SEDIMENTS COLLECTED FROM SANTA MONICA BAY DURING SO. CAL. BIGHT '98. J. W. Anderson, J. M. Jones, and D. L. McCoy, Columbia Analytical Services
- 3:00 - 3:20 BREAK
- 3:20 - 3:40 56 ATMOSPHERIC DEPOSITION OF POLLUTANTS TO SANTA MONICA BAY. K. Schiff<sup>1</sup>, K. Stolzenbach<sup>2</sup>, and L. Tiefenthaler<sup>1</sup>, <sup>1</sup>Southern California Coastal Water Research Project, <sup>2</sup>UCLA
- 3:40 - 4:00 57 MOLECULAR MARKERS AS POLLUTANT AND NATURAL SOURCE DISCRIMINANTS IN SANTA MONICA BAY, CALIFORNIA. T. D. Lorenson<sup>1</sup>, J. J. Kolak<sup>1</sup>, F. D. Hostettler<sup>1</sup>, R. J. Rosenbauer<sup>1</sup>, K. A. Kvenvolden<sup>1</sup>, and E. Zeng<sup>2</sup>, <sup>1</sup>U.S. Geological Survey, <sup>2</sup>Southern California Coastal Water Research Project
- 4:00 - 4:20 58 STORMWATER INPUT AND INTEGRATION INTO THE WATER COLUMN OF SANTA MONICA BAY: SPATIAL AND TEMPORAL CHARACTERISTICS OF STORMWATER PLUMES. B. H. Jones<sup>1</sup>, M. A. Noble<sup>2</sup>, and J. Xu<sup>2</sup>, <sup>1</sup>USC, <sup>2</sup>U.S. Geological Survey
- 4:20 - 4:40 59 SHELF-BREAK PROCESSES IN SANTA MONICA BAY. M. A. Noble, J. Xu, C. Sherwood, P. Dartnell, and H. Lee, U.S. Geological Survey
- 4:40 - 5:00 60 CLAY MINERAL SUITES IN SANTA MONICA BAY. J. R. Hein, J. S. Dowling, A. Schuetze, and H. J. Lee, U.S. Geological Survey
- 5:00 - 5:20 61 HEAVY MINERALS OF SAND-SIZED SEDIMENT, SANTA MONICA BAY. F.L. Wong and R.C. Lewis, U.S. Geological Survey
- 5:00 - 7:00 POSTER SESSION/RECEPTION (Commons Restaurant)

**FRIDAY EVENING, 5:00-7:00 p.m.**POSTER SESSION -- BEER, WINE & CHEESE RECEPTION:COMMONS RESTAURANTPOSTER CHAIR: Dr. Kathryn Dickson, California State University, Fullerton

- P1 EVIDENCE OF THE 1997-1998 EL NIÑO IN A LOCAL OCEAN MONITORING PROGRAM. D. O'Donohue and A. Groce, City of San Diego, Ocean Monitoring Program, San Diego, CA
- P2 EVIDENCE OF THE 1997-1998 EL NIÑO IN THE FISH COMMUNITY OFF SAN DIEGO. R. Gartman and A. Groce, City of San Diego, Ocean Monitoring Program, San Diego, CA
- P3\* CHANGES IN DIET OF TERNS AND SKIMMERS NESTING AT THE BOLSA CHICA ECOLOGICAL RESERVE IN SOUTHERN CALIFORNIA: POSSIBLE RESPONSES TO CLIMATE CHANGE AND SHIFTS IN PREY POPULATIONS. M. H. Horn and W. M. Dahdul, California State University, Fullerton CA
- P4\* DECLINE OF SPECIES DIVERSITY AND STANDING STOCK AT LITTLE CORONA DEL MAR'S ROCKY INTERTIDAL, SOUTHERN CALIFORNIA. L. Shafer, P. Bennett, T. Anderson, D. Williams, and D. Kelly, Orange Coast College, Costa Mesa, CA
- P5 DIET PREFERENCE HIERARCHY OF THE JUVENILE SEA HARE, *Aplysia californica* COOPER. L. Ranch, California State University, Fullerton, CA
- P6\* DISCOVERING OLD ANEW: UNPUBLISHED MUSEUM MATERIAL ALTERS THE "KNOWN" GEOGRAPHIC RANGE OF MARINE INVERTEBRATES. S.I. Lonhart<sup>1</sup> and J.W. Tupen<sup>2</sup>. <sup>1</sup>University of California, Santa Cruz, CA, <sup>2</sup>Tenera Environmental Services, San Luis Obispo, CA
- P7\* HYDROGEOLOGY AND HYDROCHEMISTRY OF THE ANIMAS BASIN AQUIFER SYSTEM, SOUTHWESTERN NEW MEXICO. M. Lee<sup>1</sup>, B. Hibbs<sup>1</sup>, and J. Hawley<sup>2</sup>, <sup>1</sup>California State University-Los Angeles, Los Angeles, CA, <sup>2</sup>New Mexico State University, Las Cruces, NM
- P8\* TO MULCH OR NOT TO MULCH: A REPORT ON VARIOUS METHODS OF WEED CONTROL ON A RESTORATION SITE. M. Lomeli, J. Albertazzi, J. Klass, and J. Beedle, Whittier College, Whittier, CA
- P9\* CUTTING COSTS: THE EFFECTIVENESS OF REVEGETATION ON ABANDONED OIL WELL SITES IN THE PUENTE-CHINO HILL CORRIDOR. C. Profeta, J. Cabral, and C. Swift, Whittier College, Whittier, CA
- P10\* RATES OF GROWTH AND MORTALITY ON COAST LIVE OAKS, CALIFORNIA WALNUTS AND TOYON. M. Rahe, T. Wiater, and C. Swift, Whittier College, Whittier, CA
- P11\* ENDOHELMINTHS OF WHITE CROAKER FROM THE LOS ANGELES HARBOR AREA, SOUTHERN CALIFORNIA. J. Peng and C. Hogue, California State University, Northridge, CA
- P12\* MACROPARASITES OF PACIFIC SANDDAB FROM POLLUTED WATERS OF THE PALOS VERDES SHELF, SOUTHERN CALIFORNIA. J. Paris and C. Hogue, California State University, Northridge, CA
- P13 AGE, GROWTH, AND MATURITY OF THE LONGFIN SANDDAB (*Citharichthys xanhostigma*) OFF SAN DIEGO, CALIFORNIA. A. Groce<sup>1,2</sup> and C. Jenkins<sup>2</sup>, <sup>1</sup>City of San Diego, Ocean Monitoring Program, San Diego CA, <sup>2</sup>San Diego State University, San Diego, CA

- P14\* MERISTIC AND MORPHOLOGICAL VARIATION AMONG CALIFORNIA POPULATIONS OF THE MARINE SILVERSIDE FISH, *Atherinops affinis* (TELEOSTEI: ATHERINOPSIDAE). K. M. O'Reilly and M. H. Horn, California State University, Fullerton, CA
- P15\* HIGH CREATINE PHOSPHOKINASE ACTIVITY IN THE WHITE MUSCLE OF THE ENDOTHERMIC MAKO SHARK. G. Lopez and K. A. Dickson, California State University, Fullerton, CA
- P16 HERETOFORE UNDOCUMENTED VARIATION OF THE INTRINSIC HAND MUSCULATURE IN A JUVENILE BABOON. K. C. Noriega, The Claremont Colleges, Claremont, CA
- P17\* ASSOCIATION STUDY OF THE B3-ADRENERGIC RECEPTOR POLYMORPHISM WITH RISK FACTORS FOR COLON CANCER. D. H. Nguyen<sup>1</sup>, R. C. Bada<sup>1</sup>, R. W. Haile<sup>1</sup>, H. D. Frankl<sup>2</sup>, E. R. Lee<sup>3</sup>, S. A. Ingles<sup>1</sup>. <sup>1</sup>Preventive Medicine, USC/Norris Cancer Center, Los Angeles, CA, <sup>2</sup>Division of Gastroenterology, Sunset Kaiser Permanente Medical Center, Los Angeles, CA, <sup>3</sup>Division of Gastroenterology, Bellflower Kaiser Permanente Medical Center, Los Angeles, CA
- P18\* PRELIMINARY OBSERVATIONS ON MARINE MAMMALS IN THE SANTA MONICA BAY, CALIFORNIA. M. Bearzi<sup>1,2</sup> and B. Steinmetz<sup>2</sup>, <sup>1</sup>University of California, Los Angeles, CA, <sup>2</sup>Ocean Conservation Society, Los Angeles, CA
- P19\* GENETIC VARIATION IN THE EASTERN PACIFIC BAY PIPEFISH, *Syngnathus leptorhynchus* (GASTEROSTEIFORMES: SYNGNATHIDAE). K. D. Louie, K. P. Koepfli, and D. K. Jacobs, University of California, Los Angeles, CA
- P20\* INTRASPECIFIC PHYLOGEOGRAPHY OF *Atherinops affinis* (TELEOSTEI: ATHERINOPSIDAE) FROM CALIFORNIA WATERS USING SEQUENCES OF THE mtDNA CONTROL AND NUCLEAR ITS-1 REGIONS. J. W. Cavanagh and M. H. Horn, California State University, Fullerton, CA
- P21\* GENETIC VARIATION IN VERNAL POOL CRUSTACEANS. Erin Bomcamp and Douglas Eernisse, Department of Biological Sciences, California State University, Fullerton, Fullerton, CA 92831-3599
- P22 WATER QUALITY IN THE SAN GABRIEL RIVER, LOS ANGELES, CA J.G. Hering, M.P. Bachmann, D.E. Giammar, A.M. Hyldahl, Y.P. Liu, T.M. Salmassi, California Institute of Technology, Environmental Engineering Science (138-78), Pasadena, CA 91125
- P23 HERBARIUM DATABASES: CREATION AND MAINTENANCE, R. Schramm, Lichen Herbarium, Department of Plant Biology, Arizona State University P.O. Box 87 1601, Tempe, AZ 85287-160
- P24 LOCALLY RARE PLANTS OF VENTURA COUNTY, D. L. Magney, David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346
- P25 VENTURA COUNTY VASCULAR PLANT SPECIES OF LOCAL CONCERN, David Magney, David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346

\* Indicates Students Competing for an award

**SATURDAY SLH 102****MORNING**

**SYMPOSIUM:** NEW AND RARE FISH AND INVERTEBRATE SPECIES TO CALIFORNIA DURING THE 1997-1998 EL NIÑO

**CHAIRS:** M. James Allen, So. Calif. Coastal Water Res. Proj.,  
Daniel J. Pondella,II, Vantuna Res. Grp., Occidental College

Time	No.	Paper
9:00 - 9:20	62	NEW AND UNUSUAL INVERTEBRATES DISCOVERED AT THE CALIFORNIA CHANNEL ISLANDS DURING THE 1997-1998 EL NIÑO. <u>J.M. Engle</u> <sup>1</sup> and D.V. Richards <sup>2</sup> , <sup>1</sup> Tatman Found. & Mar. Sci. Inst., UCSB, <sup>2</sup> Channel Islands. National. Park
9:20 - 9:40	63	NORTHERN RANGE EXTENSIONS INTO THE SOUTHERN CALIFORNIA BIGHT OF TEN DECAPOD CRUSTACEA RELATED TO THE 1991/92 AND 1997/98 EL NIÑO EVENTS. <u>D. E. Montagne</u> and D. B. Cadien, Mar. Biol. Lab., Co. Sanit. Dist. Los Angeles Co.
9:40 - 10:00	64	*MULTIPLE MECHANISMS ALTER THE GEOGRAPHIC RANGE OF MARINE COASTAL INVERTEBRATES <u>S. I. Lonhart</u> <sup>1</sup> and J.W. Tupen <sup>2</sup> , <sup>1</sup> Dept. Biol., UC Santa Cruz, <sup>2</sup> Tenera Environ. Serv.
10:00 - 10:20	65	SHIFTS IN FISH AND INVERTEBRATE ASSEMBLAGES OF TWO SOUTHERN CALIFORNIA ESTUARIES DURING THE 1997-98 ENSO. <u>J. M. West</u> <sup>1</sup> , G. D. Williams <sup>1</sup> , and J. B. Zedler <sup>2</sup> , <sup>1</sup> Pac. Estuar. Res. Lab, SDSU, <sup>2</sup> Univ. Wisconsin, Bot. Dept.
10:20 - 10:40	66	FISH POPULATION FLUCTUATIONS 1996-2000 IN LAGOONS ON MARINE CORPS BASE CAMP PENDLETON – <u>C. C. Swift</u> <sup>1</sup> & D. C. Holland <sup>2</sup> , <sup>1</sup> L. A. County Natural History Museum, <sup>2</sup> Camp Pendleton Amphibian & Reptile Survey
10:40 – 11:00		BREAK
11:00 - 12:00		PLENARY SESSION, SLH 200

\* Indicates student competing for an award

**AFTERNOON**

**SYMPOSIUM:** NEW AND RARE FISH AND INVERTEBRATE SPECIES TO CALIFORNIA DURING THE 1997-1998 EL NIÑO

**CHAIRS:** M. James Allen, So. Calif. Coastal Water Research Project,  
Daniel J. Pondella,II, Vantuna Res. Grp., Occidental College

Time	No.	Paper
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- 1:20 – 1:40 67 RECORDS OF MEXICAN BARRACUDA (*Sphyrna ensis*) IN SOUTHERN CALIFORNIA WITH NOTES ON SCALLOPED HAMMERHEAD (*Sphyrna lewini*) AND PACIFIC SIERRA (*Scomberomorus sierra*). M. Shane, SDSU
- 1:40 – 2:00 68 NOTES ON THE ADDITION OF THE PACIFIC CORNETFISH (*Fistularia corneta*) TO THE SOUTHERN CALIFORNIA BIGHT FAUNA AND RELATED NOTES ON OTHER RARE FISH AND INVERTEBRATES OBSERVED DURING THE 1997-1998 EL NIÑO (WITH SOME EARLIER UNREPORTED COLLECTIONS). M.D. Curtis<sup>1</sup>, R.H. Moore<sup>1</sup>, D.G. Vilas<sup>1</sup>, and K.T. Herbinson<sup>2</sup> <sup>1</sup>MBC Appl. Environ. Sci., <sup>2</sup>So. Calif. Edison
- 2:00 – 2:20 69 THE ADDITION OF A LIZARDFISH (SYNODONTIDAE) AND A DRAGONET (CALLIONYMIDAE) TO THE CALIFORNIA ICHTHYOFAUNA. A. Groce<sup>1</sup>, M.J. Allen<sup>2</sup>, <sup>1</sup>City San Diego, Ocean Monit. Prog., <sup>2</sup>So. Calif. Coastal Water Res. Proj.
- 2:20 – 2:40 70 ADDITION OF BLACKSPOT WRASSE (*Decodon melasma*) AND SPECKLEDTAIL FLOUNDER (*Engyophrys sanctilaurentii*) TO THE CALIFORNIA FAUNA M. J. Allen<sup>1</sup> and A. K. Groce<sup>2</sup>. <sup>1</sup>So. Calif. Coastal Water Res. Proj. <sup>2</sup>City San Diego, Metro. Wastewater Dept.
- 2:40 – 3:00 71 FIRST SIGHTING AND RARE OCCURRENCE OF THREE SUBTROPICAL FISHES IN SOUTHERN CALIFORNIA – M. T. Craig & D. J. Pondella II, Vantuna Research Group, Occidental College
- 3:00 – 3:20 BREAK
- 3:20 - 3:40 72 NEW AND UNUSUAL REEF FISH DISCOVERED AT THE CALIFORNIA CHANNEL ISLANDS DURING THE 1997-1998 EL NIÑO. D. V. Richards<sup>1</sup> and J. M. Engle<sup>2</sup>, <sup>1</sup>Channel Islands National Park, <sup>2</sup>Tatman Found. & Mar. Sci. Inst., UCSB
- 3:40 - 4:00 73 DISTRIBUTIONAL NOTES ON THE FISHES OF FIEBERLING GUYOT, WITH A DESCRIPTION OF A NEW SPECIES OF *Nezumia* (GADIFORMES: MACROURIDAE). R. R. Wilson Jr., Dept. Biol. Sci., CSULB
- 4:00 - 4:20 74 LONG TERM TRENDS IN UNUSUAL OCCURENCES: HOW UNUSUAL IS UNUSUAL? Alan J. Mearns; National Oceanic and Atmospheric Administration, Hazardous Materials Response Division, Seattle, WA 98115-0700

**SATURDAY OHE 122****MORNING**

SYMPOSIUM: THE LOS ANGELES RIVER: DISCHARGES, FATES AND EFFECTS

CHAIR: Dr. Tina Hartney, Occidental College

Time	No.	Paper
8:15 - 8:20		INTRODUCTORY REMARKS. <u>T. Hartney</u> , Occidental College
8:20 - 8:40	75	STORMWATER MONITORING UNDER THE LOS ANGELES COUNTY NPDES MUNICIPAL STORMWATER PERMIT. <u>B. DePoto</u> , Los Angeles County Department of Public Works, Environmental Programs Division
8:40 - 9:00	76	SOME SOURCES OF BACTERIAL INPUTS INTO THE LOS ANGELES RIVER FROM DOWNTOWN LOS ANGELES, CALIFORNIA. <u>J.H. Dorsey</u> , M.E. Mullin, and T. Tran, City of Los Angeles, Stormwater Management Division.
9:00 - 9:20	77	AT THE RIVER'S END: PERSPECTIVES FROM THE CITY OF LONG BEACH. <u>R. Collins</u> , Clean Water Program, City of Long Beach (Abstract not available)
9:20 - 9:40	78	IMPACTS OF THE LOS ANGELES AND SAN GABRIEL RIVERS ON THE COASTAL OCEAN - OBSERVATIONS FROM A LA NIÑA YEAR 1998-99. <u>B. H. Jones</u> <sup>1</sup> , A. Steele <sup>2</sup> , M. Mengel <sup>3</sup> and J. Shisko <sup>4</sup> . <sup>1</sup> Department of Biological Sciences University of Southern California, <sup>2</sup> Sanitation Districts of Los Angeles County, <sup>3</sup> Orange County Sanitation District, and <sup>4</sup> Environmental Monitoring Division, Hyperion Treatment Plant, City of Los Angeles
9:40 - 10:00	79	CITIZEN WATER QUALITY MONITORING IN THE LOS ANGELES RIVER WATERSHED. <u>D. E. Gregorio</u> , Southern California Marine Institute and State Water Resources Control Board
10:00 - 10:20	80	OCCURRENCE OF <i>Heterosigma akashiwo</i> IN SAN PEDRO BAY, CALIFORNIA, USA. <u>D. E. Gregorio</u> <sup>1</sup> and L. Connell <sup>2</sup> . <sup>1</sup> Southern California Marine Institute and <sup>2</sup> University of Washington, Fisheries Department
10:20 - 10:40	81	FOLAR RIVERWATCH: ADDRESSING WATERSHED ISSUES IN THE NEW MILLENNIUM. <u>J. V. Greenwood</u> , Friends of the Los Angeles River (FoLAR)
10:40 - 11:00		BREAK
11:00 - 12:00	82	PLENARY SESSION SLH 200 KEYNOTE PRESENTATION ABOUT WATERSHED MANAGEMENT IN THE LOS ANGELES AND SAN GABRIEL RIVERS WATERSHED AND THE COUNCIL'S NEW PUBLICATION: "STORM WATER: ASSET NOT LIABILITY," <u>Dorothy Green</u> , President, Los Angeles and San Gabriel Rivers Watershed Council.



## AFTERNOON

SYMPOSIUM: ECOLOGY OF SOUTHERN CALIFORNIA RIPARIAN SYSTEMS AND POTENTIAL FOR ECOLOGICAL RESTORATION OF THE LOS ANGELES RIVER

CHAIR: Elizabeth Braker

Time	No.	Paper
1:30-1:40		Introduction and Welcome. E. Braker and C. Swift.
1:40 - 2:00	83	DETERMINANTS OF PLANT COMMUNITY STRUCTURE IN SOUTHERN CALIFORNIA RIPARIAN HABITATS. <u>C.C. Swift</u> <sup>1</sup> , E. Braker <sup>2</sup> & J. Albertazzi <sup>2</sup> . <sup>1</sup> Whittier College, <sup>2</sup> Occidental College
2:00 - 2:20	84	BREEDING BIRD SPECIES AS INDICATORS OF RIPARIAN ECOSYSTEM HEALTH IN URBAN LOS ANGELES: A LOCAL AND REGIONAL PERSPECTIVE. <u>D.S. Cooper</u> , The Audubon Center
2:20 - 2:40	85	FRESHWATER FISHES OF THE LOS ANGELES RIVER, SOUTHERN CALIFORNIA. <u>C.C. Swift</u> , L.A. County Natural History Museum and D.C. Holland, Camp Pendleton Amphibian & Reptile Survey.
2:40 - 3:00	86	HYDROLOGIC CONSTRAINTS ON URBAN RIVER RESTORATION. <u>K. D. Stolzenbach</u> , UCLA.
3:00 - 3:20		BREAK
3:20 - 3:40	87	REGIONAL RESTORATION GOALS FOR WETLAND RESOURCES IN THE GREATER LOS ANGELES DRAINAGE AREA. <u>C. Rairdan</u> , U. S. Army Corps of Engineers.
3:40 - 4:00	88	WETLANDS OF THE LOS ANGELES RIVER WATERSHED: PROFILES AND RESTORATION OPPORTUNITIES. <u>S. Woods</u> and C. Kroll, California Coastal Conservancy
4:00 - 4:20	89	ARROYO SECO RESTORATION PROJECT, <u>M. J. Zander</u> , Zander Associates Environmental Consultants.
4:20 - 4:40	90	WATERSHED PLANNING AT THE URBAN/WILDLAND INTERFACE: A CASE STUDY OF THE ARROYO SECO. <u>T. Brick</u>
4:40 - 5:00		Panel discussion. E. Braker and C. Swift. moderator

**SATURDAY SLH 200****MORNING**

SESSION: FISH: ANATOMY, PHYSIOLOGY AND EVOLUTION

CHAIR: Dr. Kathryn Dickson, Department of Biological Sciences, California State University, Fullerton

Time	No.	Paper
9:00 - 9:20	91	*COMPARATIVE MORPHOLOGY AND HISTOLOGY OF THE DIGESTIVE TRACT OF THE TELEOST FAMILY <i>Trichomycteridae</i> : THE PARASITIC CATFISHES. <u>D. M. Morales</u> <sup>1,2</sup> and J. N. Baskin <sup>1</sup> , <sup>1</sup> Cal. Poly. Pomona, <sup>2</sup> Mt. San Antonio College
9:20 - 9:40	92	PHYLOGEOGRAPHIC RELATIONSHIPS OF THE SANDBASSES OF THE GENUS <i>Paralabrax</i> (SERRANIDAE, PERCIFORMES). <u>G. A. Herrera</u> , Natural History Museum of Los Angeles County
9:40 - 10:00	93	*LACTATE CONCENTRATIONS IN WHITE, RED AND HEART MUSCLE IN TERRESTRIAL CALIFORNIA GRUNION ( <i>Leuresthes tenuis</i> ). <u>J. E. Draais</u> , H. Lakisic, R. C. Van Winkle, and K. L. Martin, Pepperdine University
10:00 - 10:20	94	*USE OF A SYNTHETIC POLYPEPTIDE TO DETERMINE THE SEX AND REPRODUCTIVE STATUS OF FIELD-CAUGHT RED GROUPER, <i>Epinephelus morio</i> . <u>J. L. Jarrell</u> <sup>1</sup> and R. R. Wilson, Jr. <sup>2</sup> , <sup>1</sup> University of South Florida, <sup>2</sup> CSU Long Beach
10:20 - 11:00		BREAK
11:00 - 12:00		PLENARY SESSION, SLH 200

\* Indicates student competing for an award

**AFTERNOON**

SESSION: MARINE AND COASTAL ECOLOGY; WATER QUALITY Room  
Location

CHAIR: Dr. John Roberts, Chair, Biology Dept., CSU Dominguez Hills SLH 200

Time	No.	Paper
1:20 - 1:40	95	EXAMINING THE RELATIONSHIP BETWEEN PUBLIC PERCEPTIONS AND ENVIRONMENTAL QUALITY: A SURVEY STUDY OF BEACH USE AND PERCEPTIONS IN LOS ANGELES COUNTY. <u>L.H. Pendleton</u> <sup>1</sup> , N. Martin <sup>2</sup> , and D.G. Webster <sup>1</sup> , <sup>1</sup> USC, <sup>2</sup> Yale Univ.
1:40 - 2:00	96	COMPOSITION AND DISTRIBUTION OF BEACH DEBRIS IN ORANGE COUNTY, CALIFORNIA. <u>S. L. Moore</u> <sup>1</sup> , D. Gregorio <sup>2</sup> , M. Carreon <sup>3</sup> , S. B. Weisberg <sup>1</sup> , and M. K. Leecaster <sup>1</sup> , <sup>1</sup> Southern California Coastal Water Research Project, <sup>2</sup> Southern California Marine Institute, <sup>3</sup> Divers Involved Voluntarily in Environmental Rehabilitation and Safety

- 2:00 - 2:20 97 EFFICIENCY AND ACCURACY OF STORMWATER MASS EMISSION MONITORING PROGRAMS IN SOUTHERN CALIFORNIA. L. Tiefenthaler, K. Schiff and M. Leecaster, Southern California Coastal Water Research Project
- 2:20 - 2:40 98 USING THE SEDIMENT QUALITY TRIAD APPROACH IN SEDIMENT QUALITY MONITORING NEAR A SOUTHERN CALIFORNIA MUNICIPAL WASTEWATER OUTFALL. J.L. Armstrong, M.E. McCarthy, K.A. Sakamoto, and C.M. Thomas, Orange County Sanitation District
- 2:40 - 3:00 99 \*NITRATE CONTAMINATION OF SURFACE WATER AND SHALLOW GROUNDWATER IN THE IRVINE SUBBASIN, ORANGE COUNTY, CALIFORNIA. James Walker, B. Hibbs, and M. Lee, CSU Los Angeles
- 3:00 - 3:20 BREAK
- 3:20 - 3:40 100 \*ENERGY ALLOCATION AND POSTNATAL GROWTH IN FISH-EATING SEABIRDS: FEEDING TRIALS WITH CAPTIVE ELEGANT TERN CHICKS RAISED ON HIGH VS. LOW ENERGY DIETS. W. M. Dahdul and M. H. Horn, CSU Fullerton
- 3:40 - 4:00 101 \*TROPIC POSITION OF SOUTHERN CALIFORNIA ESTUARINE AND ISLAND POPULATIONS OF THE SILVERSIDE FISH *Atherinops affinis* (TELEOSTEI: ATHERINOPSIDAE): ANALYSES OF 15N AND 13C STABLE ISOTOPES AND DIETARY ITEMS. D. Smith and M. Horn, CSU Fullerton
- 4:00 - 4:20 102 \*MICROSATELLITE DIVERSITY IN THE MESOPELAGIC SHRIMP *Acanthephyra curtirostris* (CARIDEA: OPLOPHORIDAE). J. R. Scarbrough, J. F. Sands, D. L. Cowles, and R. L. Carter, Loma Linda University
- 4:20 - 4:40 103 BIODIVERSITY AND DISTRIBUTION OF PERACARID CRUSTACEAN ASSEMBLAGES OFF SAN DIEGO, SOUTHERN CALIFORNIA. T.D. Stebbins, City of San Diego Marine Biology Laboratory
- 4:40 - 5:00 104 \*TEMPERATURE EFFECTS ON THE FEEDING ECOLOGY OF THREE SEAWEED-EATING SPECIES OF *Tegula* (TROCHIDAE:GASTROPODA) FROM CENTRAL AND SOUTHERN CALIFORNIA. E. Yee and S. Murray, CSU Fullerton
- 5:00 - 6:00 SCAS Business Meeting (SLH 100)

\* Indicates student competing for an award

**SATURDAY SAL 101****MORNING**

SESSION: LICHEN SYMPOSIUM

CHAIR: David Magney, David Magney Environmental Consulting &amp; California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346

Time	<u>No.</u>	Paper
9:00 – 9:20		INTRODUCTION AND INTRODUCTIONS, David Magney
9:20 – 9:40	105	LICHENS OF THE CALIFORNIA CHANNEL ISLANDS, <u>Charis Bratt</u> , Santa Barbara Botanic Garden 1212 Mission Canyon Road, Santa Barbara, CA 93105
9:40 – 10:00	106	CONVERATION OF CALIFORNIA LICHENS, <u>David Magney</u> , David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346
10:00 – 10:20	107	VARITION IN THALLUS MORPHOLOGY, CHEMISTRY, EXCIPL ANATOMY AND SPORE ULTRASTRUCTURE OF THE SAXICOLOUS LICHENS TREATED WITHIN THE <i>Buellia retrovertens</i> GROUP, <u>Frank Bungartz</u> , Lichen Herbarium, Department of Plant Biology, Arizona State University P.O. Box 87 1601, Tempe, AZ 85287-1601
10:20 – 10:40	108	CALLEGUAS CREEK WATERSHED WETLAND RESTORATION PLANNING, <u>David Magney</u> , David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346
10:40 – 11:00		BREAK
11:00 – 12:00		PLENARY SESSION, SLH 200

## ABSTRACTS

### 1 COASTAL WETLANDS RESTORATION PROJECT PLANNING

D.G. Cannon, Everest International Consultants, Inc., Long Beach, California, 90802

The continued development of coastal areas and compliance with environmental regulation has led to increased implementation of coastal wetland restoration projects throughout the United States. Although these types of projects have been implemented since the 1970's, the planning and design of these multidisciplinary endeavors is still in its infancy compared to other development projects such as flood control and highways. With limited budgets and demanding schedules, optimal allocation of funds among various technical disciplines and across phases is critical in meeting project goals. The key to successful navigation of this difficult path to success is effective planning.

The first step is to develop a project plan that covers the entire lifecycle of a coastal restoration project through each of the six phases: conceptual design, preliminary design, environmental review/permitting, final design, construction, and monitoring. The next step is to identify the various technical disciplines and establish the work timeframes needed throughout the project. From this information, a key team of technical experts can be established that will form the backbone of the restoration planning and design effort from start to finish. Forming a strong multidisciplinary team at project inception will eliminate the myopic approach that sometimes results when projects are lead by individuals with focused expertise in one discipline. Finally, an effective management program must be established to successfully orchestrate the tasks being carried out by the various technical experts.

### 2 THE USE OF NUMERICAL MODELS IN WETLAND PLANNING AND DESIGN

Y.-K. Poon, Everest International Consultants, Inc., Long Beach, CA 90802

Wetland restoration is an accepted means for development projects to obtain mitigation credits to offset the loss of marina habitat. It also occurs periodically as enhancement of degraded habitat by resource agencies in the absence of a mitigation requirement. The elements common to most tidal wetland projects include inlet characteristics, sedimentation, hydraulics, biology, water quality, structures, utilities and material disposal. Conflicting objectives often have to be addressed in designing a wetland. Consequently, all kinds of numerical models have been used in major wetland development projects as tools to help study and resolve different conflicting design objectives. This paper presents a generalized discussion of the selection, calibration and execution of the models, as well as the interpretation of the results. The emphasis of this paper will be on the importance of proper planning of a modeling effort and the pitfalls to watch for in the interpretation of model results.

### 3 LAGOON TIDAL RESPONSE TO INLET CHANNEL VARIATION.

S. Jenkins. Scripps Institute of Oceanography

No abstract

### 4 FLOOD TIDE DELTA FORMATION, EVOLUTION, AND INFLUENCE WITHIN RESTORED TIDAL WETLAND SYSTEMS.

K. W. Merkel. Merkel & Associates, Inc. San Diego, CA 92123.

The development of flood tide deltas within coastal lagoons is a process related to availability and distribution of source sediment, tidal flow regimes, and morphology of the system. While these features are commonplace in coastal systems, rarely is it possible to monitor the evolutionary processes of flood tide bars and to explore the ramifications of these features to overall system development or change. Intensive monitoring within the restored Batiquitos Lagoon has allowed opportunities to track the development of a significant flood tide bar and witness changes in system morphology, hydraulics, and even biology associated with the developing bars.

With the developing deltas, tidal ranges within the lagoon system have been gradually muted since tidal connections were made between the ocean and lagoon in December 1996. The most evident changes in the lagoon hydraulics have been a reduction in low tide drainage and a resultant perching of tidal inundation frequencies at higher than normal levels given the retarded rate of outflow relative to a non-muted system. The flood tide deltas have also influenced the water flow, sediment transport, and wave train environments within and near the lagoon entrance channel. These changes have resulted in or contributed to significant morphologic evolutions that were not predicted. Left

unchecked, these processes will threaten the long-term viability of the system as a whole and could result in significant ecological setbacks in Lagoon development. The need for completion of planned maintenance within the flood tide deltas of created wetlands is underscored by this case study.

##### 5 VALUE OF COASTAL SALT MARSH HABITATS TO GROWTH OF THE CALIFORNIA KILLIFISH, *Fundulus parvipinnis* : A BIOENERGETICS MODELLING EVALUATION.

S. P. Madon, G. D. Williams, J. M. West, and J. B. Zedler<sup>1</sup>. Pacific Estuarine Research Laboratory, San Diego State University, San Diego, CA 92182-1870. <sup>1</sup>Botany Department, University of Wisconsin, 420 Lincoln Drive, Madison, WI 53706.

Bioenergetics models explicitly link fish energetic processes to water temperature and prey availability, and are thus valuable for evaluating effects of estuarine processes and disturbances on fish growth. We developed, tested, and used a bioenergetics model for the California killifish, *Fundulus parvipinnis*, to evaluate the potential benefits of vegetated marsh habitats to killifish feeding and growth. Three independent statistical tests revealed that the model provides accurate estimates of killifish growth. Predicted growth differed on average by only 14 % from observed values. Field estimates of food consumption show that killifish can approximately double their daily food intake by adding marsh surface foods to their diet during each 2-3 h period

Our model predicts that killifish grow from 20-44% faster if they add intertidal marsh surfaces to their subtidal feeding areas, in spite of higher metabolic costs and lower food assimilation associated with marsh feeding. Killifish may potentially grow up to 100 % faster if energy costs associated with marsh access are minimized. During most of April – May, day tides are not high enough to permit marsh access; growth of adult killifish (> 3.5 g wet mass, > 60-62 mm, TL) is more adversely affected than that of juveniles during this time, especially if water temperatures exceed 20 °C. Killifish that hatch early (April-May) experience thermal regimes and periods of marsh access through ontogeny that vary from those hatched late (August-September). These differences in thermal and marsh access experiences between early- and late-hatched fish lead to large differences in the mass achieved by the next spawning season. Early-hatched fish are 35-50% larger than late-hatched fish at 1 yr. age. Bioenergetics models are thus useful for determining the value of vegetated areas for fish (an important mitigation issue) and for setting standards (e.g., inclusion of marshes) for restoring and maintaining salt marshes as important fish habitat in southern California

##### 6 HABITAT GOALS FOR SAN FRANCISCO BAY AND THEIR PRACTICAL APPLICATION

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In 1998, the San Francisco International Airport unveiled plans for a major expansion of its runway facilities. The new runway configuration is necessary to handle increased jumbo jet traffic into the region. Several plans were proposed and each would involve major fill placement into the Bay, upwards of 570 hectares. If approved, this would be the largest fill of its kind in San Francisco Bay. The Airport has proposed to purchase and restore the remaining 12,000 hectares of salt ponds in the south Bay as mitigation

The implementation of such a major restoration program requires consideration of a variety of issues. Paramount is the fact that the salt pond levees provide flood protection for much of the Silicon Valley. The removal or breaching of these outer levees would result in tidal flooding throughout the south Bay. A major re-construction of levees inland would be required to implement the restoration plan. In addition, the salt ponds themselves have a variety of individual constraints (such as bathymetry, endangered species use, power line and infrastructure considerations, and existing pond salinity) that will affect the overall project design.

Using the guidelines of the San Francisco Bay Habitat Goals project, a number of alternatives plans are possible. Most plans promote tidal wetland restoration as the primary habitat type. Because subsidence is a major problem in the south Bay, a large amount of sediment will be required to create tidal marsh habitat. A dredging program coupled with natural sedimentation is perhaps the most economic to gain the final elevations necessary for marsh plant colonization. Over 17 million cubic meters of dredged material and 43 million cubic meters of natural sedimentation will be required. Other elements of the habitat restoration include use of waste water for freshwater marsh creation and implementation of seasonal wetland habitat in selected areas.

##### 7 CORDGRASS (*SPARTINA FOLIOSA*) EXPANSION ONTO INTERTIDAL MUDFLATS AT TIJUANA ESTUARY- PREDICTIONS FROM A SIMULATION MODEL AND IMPLICATIONS FOR RESTORATION

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Following heavy winter storms and sedimentation in 1993 and 1995, new cordgrass clones established and expanded in a 6.5-ha. mudflat at Tijuana Estuary, with over 80 new clones present by 1997. Measurements in 1998 and 1999 revealed a mean annual expansion rate of 2.35 m. Expansion was spatially and temporally variable and was not related to patch size, stem density or elevation. New seedlings recruited in 1998 (>55) and 1999 (>30), suggesting that seedling recruitment may be more common than previously thought. Our data were incorporated into an individual-based computer model (C<sup>++</sup>) and used in order to predict how long it will take to convert the existing mudflat to cordgrass marsh. Model results indicate that the initial distribution of cordgrass patches and seedling recruitment affect rate of mudflat loss, but spatial and temporal heterogeneity in cordgrass expansion rates do not. Our “best-guess” prediction from this model is that over 95% of the remaining mudflat will convert to cordgrass marsh within 30 years (2027). We recommend that wetland restoration in southern California include large areas of intertidal mudflat both to create habitat for shorebird feeding as well as to allow for future colonization by cordgrass. Furthermore, our model may prove to be a useful tool in restoration by predicting how rapidly full coverage of cordgrass may be achieved given different planting densities, rates of spread, and new recruitment from seed.

## 8 INTEGRATING SPATIAL AND TEMPORAL VARIABILITY INTO FISH DIET ANALYSES PROVIDES A BETTER UNDERSTANDING OF THE TIJUANA ESTUARY FOOD WEB.

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Our understanding of fish feeding interactions at Tijuana Estuary (TE; a National Estuarine Research Reserve) was improved by incorporating estimates of spatial and temporal variability into diet analyses. We examined the stomach contents of over 500 fishes (representing eight dominant species) collected between 1994 and 1998. General feeding patterns, pooled over time and complemented with 1994 stable isotope data, were used to develop a basic food web consisting of 3 major trophic levels: 1. primary consumers (*Atherinops affinis* and *Mugil cephalus*) that ingested substantial amounts of plant material and detritus; 2. second-level benthic carnivores (*Clevelandia ios*, *Hypopsetta guttulata*, *Gillichthys mirabilis*, and *Fundulus parvipinnis*) that ingested high numbers of calanoid copepods and exotic amphipods (*Grandidierella japonica*); and 3. third-level piscivores (*Paralichthys californicus* and *Leptocottus armatus*) that often preyed on smaller gobiids. Similarity-based groupings of individual species' diets were conducted using nonmetric multidimensional scaling (NMDS) to characterize their variability both within and between species, and in space and time. This allowed us to pinpoint instances where major dietary shifts occurred and identify events (e.g., modified prey abundance during 1997-98 El Niño) that likely caused these shifts. Knowledge of fish feeding can assist in understanding and managing estuarine resources. Baseline data can be used as a tool to assess feeding interactions and the functionality of restored systems, determine impacts of exotic species on food web functioning, as well as evaluate trophic responses to large-scale disturbances (e.g., flooding and sedimentation during El Niño events).

## 9 THE DESIGN AND RESEARCH PLAN OF THE MODEL MARSH IN CONTRIBUTING TO RESTORATION ECOLOGY.

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Wetland creation and restoration have become standard practices to compensate for the rapid loss of our nation's coastal resources. Considerable debate centers on what types of habitats to restore and how to restore – there is critical need for methods and techniques that create coastal wetlands with functional attributes similar to those observed in natural systems. Many restored areas bear little resemblance to natural habitats where multi-scale heterogeneity is the rule, and where complex tidal creek networks infuse areas of tidal mudflats and salt marshes with multiple species assemblages. The newly excavated 20-acre Model Marsh located in Tijuana Estuary, San Diego County, provides a unique opportunity to develop and test restoration methods within a large-scale experimental system. The main goal of the Model Marsh project is to evaluate the influence of tidal creek networks on restored marsh function and structure using 3-acre replicated treatments with and without creeks. Various restoration techniques are developed to promote and sustain biodiversity within a framework that emphasizes heterogeneity at the landscape, habitat, sub-habitat and species assemblage levels. Planting designs utilizing different levels of species diversity as well as culm densities

will be discussed. In addition, soil amendment (kelp) significantly promotes plant productivity in nutrient-poor soils typical of restored sites in southern California, as evidenced in results that will be presented from both field and greenhouse studies. Ultimately, these techniques may promote rapid development of a newly restored system. Furthermore, these functional evaluations are intended to enable restorationists to characterize potential pathways and endpoints and to develop system trajectories (i.e. "performance curves").

10 VALUE OF SHALLOW WATER HABITAT CREATED IN THE OUTER LOS ANGELES HARBOR

K. Green, R.G. Appy. MEC Analytical Systems, Inc. & Port of Los Angeles

No Abstract

11 RELOCATION OF A LARGE BLACK-CROWNED NIGHT HERON COLONY IN SOUTHERN CALIFORNIA

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A large black-crowned night heron (*Nycticorax nycticorax*) colony was relocated as a mitigation measure for destruction of the existing colony site. The Port of Long Beach is currently developing the former U.S. Naval Station Long Beach into a marine container terminal. When the Naval Station was operational, a large heron colony (up to 500 pairs) occupied mature fig and olive trees that lined the Station streets. Although *N. nycticorax* is abundant throughout Southern California, a colony of this size is unusual. As part of an agreement with the U.S. Fish and Wildlife under the Migratory Bird Treaty Act, the Port agreed to relocate the colony before construction of the terminal began. Fifty mature fig (*Ficus* spp.), olive (*Olea* sp.), and paperbark (*Melaleuca* sp.) trees were boxed and transported to an existing park approximately one mile from the original site. The relocated trees supplemented approximately 70 trees already at the park. Decoys were placed in the trees and heron vocalizations recorded from the original colony were played twice per day. One year of monitoring has been completed and the results are promising: in 1999 over 250 active nests produced over 650 young. The Port will monitor for an additional four years. This project is unique because there is no other documented relocation of a *N. nycticorax* colony of this size.

12 INCREASE IN THE CALIFORNIA LEAST TERN POPULATION AT LOS ANGELES HARBOR IN RESPONSE TO NEWLY-CREATED DREDGE FILL HABITAT IN LOS ANGELES HARBOR.

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In 1995, the Port of Los Angeles initiated construction of Pier 400, a 582-acre shipping container storage area, via a massive dredging operation. The substrate within most of the fill for Pier 400 consisted of medium to coarse white sand with shell fragments. California Least Terns (*Sterna antillarum brownii*) had nested for several years at a nearby nesting site in the harbor, but in 1995, they initiated 93 nests at Pier 400 and produced an estimated 105 fledglings, more than any year at former Los Angeles Harbor nesting sites since 1984. Reproductive success values exceeded those for all the years nesting success has been regularly monitored in the harbor. Least Terns nested in increasing numbers at Pier 400 in the following two years, and in 1999, when the Least Tern nesting sites to the north (Venice Beach) and south (Seal Beach Wildlife Refuge) failed, the Pier 400 site apparently provided an alternate nesting site for birds from these nesting areas. In addition, construction activities were occurring on Pier 400 during the Least Tern nesting season, but education programs and regular communication with contractors precluded any disturbance of nesting Least Terns.

13 SYNTHESIS AND PHOTOOXIDATION OF GOLD (I) TRIPHENYLPHOSPHINE PHENYLTHIOLATE

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Singlet oxygen undergoes a variety of reactions with metal thiolates. In sulfur-metal compounds, previous studies have shown that singlet oxygen oxidizes the sulfur portion of compounds with high transitional metals. However, for lower transitional metals, singlet oxygen tends to bind to the metal. In the case of gold-sulfur compounds (Au being a low transitional metal), the bonding behavior does not necessarily follow that trend. Gold [Au(I)] compounds have been used in the treatment of rheumatoid arthritis, but the molecular mechanism is not clearly understood. In this investigation, the compound gold(I) triphenylphosphine phenyl thiolate [ $C_6H_5S-Au-PPh_3$ ] was synthesized using sodium phenyl thiolate ( $[C_6H_5S^-Na^+]$ ) and triphenylphosphine gold ( $[Cl-Au-PPh_3]$ ), as a model to study the oxidative behavior and potential oxidation sites of singlet oxygen. The compound was exposed to singlet oxygen via



photosensitization, and characterized by  $^1\text{H}$  and  $^{31}\text{P}$  nuclear magnetic resonance and UV-visible spectroscopy. The results show that under an aprotic condition at low temperature (-70C) the singlet oxygen reacted with the gold to produce an unstable peroxy group.

#### 14 HEPATOCYTE-SPECIFIC MUTATION ESTABLISHES RXRa AS A HETERODIMERIC INTEGRATOR OF MULTIPLE PHYSIOLOGICAL PROCESSES IN THE LIVER

Georgette Enriquez, Dr. Henry Sucov, Institute of Genetic Medicine

A large number of physiological processes in the adult liver are regulated by nuclear receptors that require heterodimerization with retinoid x receptors (RXR). To gain insight into the hepatic function of RXRa, cre-mediated recombination was used to disrupt the RXR gene specifically in hepatocytes. Mice lacking RXRa in hepatocytes are viable, but exhibit alterations in numerous physiological pathways. The cholesterol metabolism gene *Cyp7A*, which is subject to opposing regulation by LXR and FXR, is significantly induced in the absence of RXRa. The cholesterol pathway was pursued in more detail by subjecting mice to a high cholesterol diet. While normal mice are able to process and eliminate excess dietary cholesterol, mice lacking RXRa in hepatocytes instead accumulate hepatic cholesterol and have elevated serum cholesterol. Hepatic cholesterol is marginally elevated in RXRa mutant mice (4.4+/-0.3) relative to non RXRa mutant mice (3.5+/-0.4). Hepatic cholesterol levels are negatively regulated by bile acids through the FXR pathway. Thus, every one of the examined RXR-mediated metabolic pathways in the liver is compromised in the absence of RXRa. These data demonstrate the presence of a complex circuitry in which RXRa is integrated into a number of diverse physiological pathways as a common regulatory component of cholesterol, fatty acid, bile acid, steroid, and xenobiotic metabolism and homeostasis. By understanding first, the basic fundamentals of cholesterol pathways, a more constructive approach can be made in the future for treating cholesterol related diseases.

#### 15 MODE OF MAJOR HISTOCOMPATIBILITY COMPLEX EVOLUTION IN THE GREENBULS (AVES: PYCNONOTIDAE)

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The major histocompatibility complex (Mhc) is a highly variable multi-gene family found in vertebrates. Mhc genes are critical to immune function and many exhibit signatures of selection at the molecular level, which is hypothesized to be driven by parasites. Early studies on avian Mhc evolution have posited concerted evolution as the main mode of evolution. It is still unclear at what scale concerted events are operating, and how gene duplications and pseudogene formation come into play for the avian Mhc. I will use three species of greenbuls (little greenbul [*Andropadus virens*], gray-cheeked greenbul [*A. tephrolaemus*], & yellow-whiskered greenbul [*A. latirostris*]), for which phylogenetic relationships are known, to investigate these questions. A PCR based procedure is used to isolate Mhc loci from the three species. Mhc evolution at the genomic level will be discussed for the three species, as well as within genetically distinct populations of the little greenbul and montane greenbul.

#### 16 ELEPHANTOXENE CILIATED EUKARYOTE MICROBES, THE CALIFORNIA OBSERVATIONS

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The role of enteric microbes in cellulose digestion by mammals that mainly eat plants composed cellulose was first observed in the 1800's. Seventy years ago, C.A. Kofoid discovered ciliates in the Indian elephant involved in the digestion. Our materials came from Asian and African elephants from Fleishecher Zoo (San Francisco), a Brookfield Zoo (Chicago – the elephant killed its keeper), and Kenya (the African elephant display in the LACMNH). Through the work of K. Jollie, we have found differences in the ciliate communities – simple in the Indian elephants and quite complex in the African elephants. The Brookfield Zoo elephant, which had been given bacteriocides, had no ciliates present which could have led to its disorder.

### 17 DIFFERENCES IN VEGETATION AND TOPOGRAPHY BETWEEN AREAS OF HIGH AND LOW CALIFORNIA GNATCATCHER DENSITIES

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Certain coastal sage scrub plant species are significant predictors of high or low densities of the California gnatcatcher (*Polioptila californica californica*). The vegetation was sampled at Camp Pendleton Marine Corps Base, in northern San Diego County, in 1998. Vegetation and topography measurements were taken at seven high and seven low California gnatcatcher density sites. Vegetation, including vertical plant structure, was sampled from linear transects and 30 m quadrats; topography measurements from each site included aspect, degree of slope, and elevation but none were associated with gnatcatcher density. Common plant species that California gnatcatchers forage and nest in, including California sagebrush (*Artemisia californica*), white sage (*Salvia apiana*), and California encelia (*Encelia californica*) were significant predictors of high California gnatcatcher density. These plant species should be used in restoration plans or considered when selecting preservation areas aimed at supporting California gnatcatcher populations in the Diegan subassociation of coastal sage scrub. High gnatcatcher density sites also had a significantly higher percentage of bareground. Laurel sumac (*Malosma laurina*), a native woody species and two non-native species, fennel (*Foeniculum vulgare*) and tocalote (*Centaurea melitensis*) were significant predictors of low California gnatcatcher density. These findings will help in understanding habitat requirements and restoration strategies that may help bring back this federally threatened bird.

### 18 A FIELD INVESTIGATION OF THE CLARK MOUNTAIN FAULT COMPLEX, SAN BERNARDINO COUNTY CALIFORNIA

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The Clark Mountain fault (CMF) was first described by Hewett (1956). Despite decades of study in the east Mojave, the geometry, kinematics and even the existence of the CMF remain the subject of debate. Our research indicates that two parallel to subparallel faults strike roughly north-south along the eastern flank of the Clark Mountains and Mohawk Ridge to the south. The westernmost of the two faults juxtaposes hanging wall Cambrian Bonanza King and footwall rocks of variable lithology and age (lower Cambrian to Proterozoic). The fault plane dips gently to the west (10-30°) and is characterized by a lack of brecciation in both footwall and hanging wall rocks. The geometry and appearance of this fault is markedly similar to better-exposed thrust faults to the northeast in the Spring Mountains. We believe the fault is most likely the decollement Keaney/Mollusk Mine (KMM) thrust of Birchfiel and Davis (1971). The second major fault lies to the east in the footwall of the KMM thrust and is locally overridden by Bonanza King carbonates in the upper plate of the thrust. The fault is poorly exposed, but generally dips steeply (50-80°) to the west. The footwall is comprised of sheared Precambrian basement while the hanging wall consists of brecciated lower Cambrian Zabriskie and Cararra Formations. Slickenfiber analysis of footwall basement rocks by Rodman (1989) suggests northeast-southwest extension. Tentative interpretation of our field data indicates this fault is characterized by dip-slip, west side down movement making it a normal fault. Thus, it appears to be the Clark Mountain fault originally proposed by Hewett. Since this fault lies in the footwall of the KMM thrust, it leads to the rather problematic conclusion that extension predated compression. We suggest that early Mesozoic extension (the CMF and Ivanpah faults) created a horst block of Precambrian basement that acted as a buttress for later east-directed Cretaceous KMM thrusting.

### 19 MODERN ANALOGUES FOR SIZE CLINES IN AGNOSTID TRILOBITES

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A size cline in Late Cambrian and Ordovician agnostid trilobites between 10 and 70 degrees of paleolatitude is documented from literature and partially corroborated from biostatistics of the author's field collections from the Late Cambrian of the U.S. Great Basin. Possible ecologic significance of such clines in marine organisms include: variation in fecundity, with size-related increase in egg capacity; maximizing metabolic rate at different temperatures; varying food availability within the small-particle range; mechanical disruption of shallow-water communities at high latitudes; and buoyancy to resist sinking in seawater of varying density. Least-likely analogues are size clines reported for modern marine sessile benthos (cheilostomatid bryozoans, polychaete annelids, bivalves) which have been attributed to disruption and fecundity. More-likely analogues are interpretations of size clines reported for crus-

tacean arthropods: fecundity (decapods), and metabolic rates (copepods). Interpretation of clines based on density or salinity (planktic foraminifera) are unlikely analogues, but uncertainty about soft tissue anatomy and habit in agnostids may limit their consideration.

## 20 CONSERVATION ACTIVITIES OF AQUARIUMS IN NORTH AMERICA

J. Nightingale, The Vancouver Aquarium

Abstract not received at publication date.)

## 21 LONG-TERM MARINE POPULATION STUDIES BY CABRILLO MARINE AQUARIUM

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Modern aquariums emphasize public education on the environment, and most also showcase the local aquatic environment as part of their mission. Utilizing their professional staff, volunteers, and partnerships with local universities and schools, public aquariums can create unique opportunities to conduct meaningful research on the local environment. Cabrillo Marine Aquarium has conducted population studies on selected intertidal echinoderms and molluscs for over 25 years, and on grunion spawning levels and egg viability for nearly ten years. These studies have resulted in unusually long-term quantitative data sets on these species, showing how their population sizes and recruitment patterns have changed dramatically over time with long-term climate changes, human influences, and other environmental factors. These and other examples of environmental research by a public aquarium enable students and the lay public to get directly involved in research as well as to contribute to the knowledge and stewardship of their local environment.

## 22 PRELIMINARY NOTES ON THE CAPTIVE SPAWNING AND REARING OF STEREOLEPIS GIGAS, THE GIANT SEA BASS, AT THE LONG BEACH AQUARIUM OF THE PACIFIC

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Two years ago aquarists at the Long Beach Aquarium of the Pacific observed courtship behavior between two Giant sea bass, *Stereolepis gigas*, in the Blue Cavern Habitat. Visual observations were made with an attempt to identify specific courtship behavior leading up to a spawning event. After each successful spawning, eggs were collected with the intent to culture the young and document their growth and development. Daily observations of the developing young were recorded. These attempts to hatch and grow out the young were met with minimal success, as it was determined *S. gigas* larvae were intolerant of virtually any handling practices. In 1998, a total of three spawning events were recorded, with young surviving to 4 days post hatch. In 1999, a total of six spawning events were recorded (one on videotape), with the young surviving to 9 days post hatch. While the broods have yet to produce viable young past day 9 post hatch, the data collected is valuable and is helping to advance the captive spawning and rearing of the species.

## 23 CORAL SPAWNING AT THE BIRCH AQUARIUM AT SCRIPPS

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Coral spawns of the genus *Acropora* are rare in captivity. Determining the time of year as well as the exact time of day can be difficult. Evidence of a coral spawn at the Birch Aquarium at Scripps was found unexpectedly. A yellow froth on the surface of the coral tank's reservoir, found the morning of July 5, revealed coral eggs and sperm. On the night of July 5, 1999 another spawning occurred and was recorded on video. A staghorn (*Acropora sp.*) coral, which had resided in our coral display for over four years, was responsible for the spawn.

The spawn lasted approximately one hour. Sperm-egg bundles were released successively, from the colony's lowest branches to its highest. Polyps throughout all the branches spawned including those located at branch tips. Sperm-egg bundles were collected for rearing possibilities.

A graph was made showing time and temperature for three months (prior, during and after the spawn). This included the point at which a full moon occurred. Having determined the time of year and some of the physical parameters needed for a spawn, we anticipate another spawn for the year 2,000. With this forecast in mind, the coral tank may provide coral scientists the opportunity to observe coral reproductive behavior close up and in a controlled environment.

24 GROWING YOUNG SEA ANIMALS AND YOUNG SCIENTISTS AT THE CABRILLO MARINE AQUARIUM

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Public aquariums present scientific researchers with opportunities to observe live aquatic organisms in a controlled setting. Laboratory research at the Cabrillo Marine Aquarium consists of observing southern California ocean life throughout various life history stages. Projects have included: cloning strategies of cnidarian scyphistomae, taxonomy of southern California scyphozoa, investigations into live food cultures, and culture of various southern California fish and invertebrates. Students perform most lab activities, providing training for these future scientists. Staff serve as mentors and encourage collaboration with researchers at other institutions.

25 EFFECTIVE REMOVAL OF CARBON DIOXIDE IN AN ANCHOVY (*Engraulis mordax*) EXHIBIT AT THE AQUARIUM OF THE PACIFIC

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High concentrations of carbon dioxide are known to cause health problems in fish systems. Carbon dioxide accumulates because production rates exceed removal rates. Growth reduction, low pH, and even death are all results of elevated CO<sub>2</sub> levels. Lowered pH may have serious long-term physiological effects on fishes. Because of the importance of aesthetics in public aquariums, it can be more difficult to solve CO<sub>2</sub> problems. Any removal mechanisms have to be "hidden" from the view of the visitor.

The main focus of this study was to find the most effective method of CO<sub>2</sub> removal from a schooling fish exhibit containing anchovy *Engraulis mordax*. This exhibit was found to have significantly higher levels of CO<sub>2</sub> resulting in a significantly low pH. This was first tested by "bucket method" and then confirmed in the lab by Titrimetric Method for Free Carbon dioxide.

The "bucket method" was used on many of our exhibits to determine the reason for consistently low pH. It involves taking a 5-gallon sample of exhibit water, bubbling air into it at a high rate through a diffuser, and monitoring the results with a pH meter. If the pH begins to rise after 5 minutes of aeration, it can be assumed that CO<sub>2</sub> is being off-gassed and is the reason for the low pH.

In the exhibit, air stripping, mixing (causing turbulence at the surface for better diffusion), and chemical additions were all employed as CO<sub>2</sub> removal mechanisms. The results will be formulated from an ensuing four-month study. It is predicted that two or more of these methods in concert will be the most effective means of Carbon dioxide removal.

26 THE DESIGN AND EFFECTIVENESS OF AN ALGAL SCRUBBER ON A TEMPERATE CLOSED-SYSTEM MARINE AQUARIUM

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There is little data concerning the effectiveness of algal scrubbers for temperate marine aquaria. At the Aquarium of the Pacific an algal scrubber was constructed and added to the life support for a 615-gallon, 57° F exhibit holding invertebrates and fish. The scrubber is constructed of a 2x4x1-foot fish culture tray. It has a 1.7-gallon dump bucket, which dumps every 16 seconds, in addition to a separate 1.5 gpm supply. The lighting is four 95-watt VHO bulbs (380 watts total). At least 6 species of algae are grown on two screens with a surface area of .5-m<sup>2</sup>. The observed effects on water quality include pronounced increases in pH and alkalinity, the removal of all phosphates and a halving of the nitrate level. Nitrogen removal rates average about 6g dry N/m<sup>2</sup>/day. Since the addition of the scrubber, the exhibit has required little or no buffering, fewer water changes and has seen a drastic reduction in fouling algae. The water clarity has remained excellent without the use of carbon, even with heavy feeding of kelp (*Macrocystis*) to the resident abalone.

27 MONITORING THE REPRODUCTIVE STATUS OF SEA OTTERS (*Enhydra lutris*)

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Little is known about the complex endocrine interactions in sea otters (*Enhydra lutris*) controlling estrus, ovulation, delayed implantation and pregnancy. In an effort to understand and hopefully eventually enhance sea otter reproduction, The Seattle Aquarium (TSA) and the Center for Wildlife Conservation (CWC) have validated non-invasive radioimmunoassay (RIA) techniques to measure reproductive steroid hormones and the stress related hormone, corti-

sol, in both female and males otters from both blood and feces. Samples for use in this research have been collected as often as possible (usually 2-3 times per week) from several female sea otters housed at several facilities for at least one year to document seasonal cycling and different reproductive states including estrus, anestrus and pregnancy. Measuring endocrine levels within an individual across seasons from is essential to determining seasonal cycling, reproductive status, and the physiological dynamics of the typical sea otter reproductive cycle. For example, twice otters have exhibited very high hormone levels indicative of pregnancy, but when the whole cycle was documented it turned out to be either simply an ovulation with a corpus luteum formation or a possible pseudopregnancy. Thus several longitudinal samples from the same individual are necessary to determine reproductive status. Once we have documented the annual hormone cycle from several otters exhibiting different reproductive status (including several pregnancies) we will be on our way to developing an accurate and non-invasive pregnancy test.

## 28 KELP BED FISH: EFFECT OF A THERMAL EFFLUENT

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The effect of the thermal discharge of steam generating stations on kelp bed fish was studied by comparing the general physical condition, gut contents, and behavior of kelp bass (*Paralabrax clathratus*) and other fish living near the outfall of the San Onofre Nuclear Generating Station with the condition, gut contents, and behavior of fish living in kelp beds. Fish condition was measured with three indices: the ratio of body weight to body length, of liver weight to body weight, and of gonad weight to body weight. Results indicated that the impact of the steam generating station was to increase these indices before and during the breeding season. Body, liver and gonad indices of fish living near the outfall were usually greater than the body, liver, and gonad indices of fish living in the kelp beds. Studies of gut contents and feeding behavior suggest that an increased food availability at the outfall was reflected in fish condition.

## 29 PERMITTING AND CONSTRUCTION OF A KELP MITIGATION ARTIFICIAL REEF.

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The San Clemente Experimental Artificial Reef was built by Connolly Pacific, a marine construction company, for Southern California Edison, acting as project manager, in August - September 1999. The reef covers 22.4 acres of sea floor and the cost of construction was \$2.6 million. This paper reviews the project environmental assessment process, the licensing, and the construction aspects of the San Clemente Experimental Artificial Reef. This reef is the first phase of a two phase mitigation project whose intent is to compensate for the impact of the San Onofre Nuclear Generating Station, Units 2 and 3, on the adjacent San Onofre Kelp Bed over the operational life of the electric power station. The San Clemente Experimental Artificial Reef consists of 56 low relief modules placed in about 50 feet of water along a 2.5 mile stretch of beach from San Mateo Point to the south to the San Clemente Pier to the north. The modules, each a square of 0.4 acres, are configured to test the most effective design - best materials and best spacing of materials - for the second phase. The required mitigation is for 150 acres of kelp habitat. Kelp transplanting will also be tested in the experimental phase on 5.6 acres of the 22.4 acre reef. The environmental issues raised, the costs, the timing, the research character, and the construction details of this reef are described.

## 30 KELP TRANSPLANTION IN THE SOUTHERN CALIFORNIA EDISON EXPERIMENTAL KELP REEF PROJECT.

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Southern California Edison completed the construction of a 56 module experimental reef offshore of San Clemente, California in September 1999. The purpose of the reef is to test the suitability of quarry rock and concrete rubble at three densities (17%, 34%, and 67%) for supporting kelp and associated invertebrates and fish. Kelp transplantation has been planned onto a subset of the kelp modules to help ensure that suitable kelp populations develop within the 5-year time frame of the reef monitoring. Kelp transplantation will be performed on replicate 34% quarry rock and concrete modules that have been arrayed in 7 blocks of each module type along a 1-mile stretch of shoreline between San Mateo Point and the San Clemente Pier. The young sporophytes to be used in the transplants will begin as gametophyte cultures in the laboratory. The gametophytes will be cultured for two weeks under optimal conditions of light, nutrient, and temperature. At the end of the two week culture period, the gametophytes will have undergone gametogenesis and produced a crop of microscopic sporophytes. The culture lines with the microsporo-

phytes will be outplanted to a nursery area in the vicinity of the reef modules. Within approximately 2 months, depending on nutrient and light conditions in the field, the sporophytes will have grown to a size of 10 cm. These sporophytes will be transported onto the modules using small plastic plates anchored into the reef substrate.

### 31 RESTORATION OF A KELP BED.

D. J. Pondella, II. Vantuna Research Group, Los Angeles, CA 90041.

Since 1956, this turbidity plume from the Portuguese Bend landslide has negatively impacted the nearshore rocky reef environment from Pt. Fermin to Abalone Cove, an area that represents nearly half of the Palos Verdes Peninsula, one of the most prominent rocky headlands in the Southern California Bight. Currently, there is no other known source of turbidity in the area, other than natural erosion from the palisades. And, no other negative environmental impacts on the nearshore fauna of the Palos Verdes Peninsula have been demonstrated. Using the Marine Habitat Valuation Method (Bond *et al.* 1999) developed by the Vantuna Research Group, we found that this restoration effort would be the equivalent of restoring at least 386 acres of kelp bed habitat. This is considered to be a conservative estimate of the overall restoration value. These values represent one of the largest restoration, mitigation or enhancement efforts for the nearshore rocky reef environment in the Southern California Bight. Discussed will be the utilization of long term monitoring data and its application in the field of environmental restoration.

### 32 FISHES OF THE PALOS VERDES PENINSULA KELP BEDS: 1974-2000.

J. S. Stephens, Jr. and D. J. Pondella, II. Vantuna Research Group, Occidental College, Moore Laboratory of Zoology, 1600 Campus Rd. Los Angeles, CA 90041.

The nearshore fish assemblage of the Palos Verdes Peninsula has been monitored quarterly from 1974-2000. All conspicuous fishes were surveyed by three life history stages: adults, subadults and juveniles. After the primary faunal shift associated with the 1978-79 El Niño which resulted in a change from an Oregonian fauna to a San Diegan fauna has been well documented for both fishes and invertebrates. What is not well understood, however, is the long-term results of this faunal shift, nor the magnitude of the event. Our data tracks a decline in the density of most species during this period. In many cases these trends are a result of increased mortality early in ontogeny independent of predator density. The significance of these trends and their implications for reef productivity will be discussed.

### 33 FRIDAY PLENARY SESSION KELP BEDS OF SAN DIEGO, ORANGE AND LOS ANGELES COUNTIES; PAST, PRESENT AND FUTURE CONSIDERATIONS

Wheeler J. North, California Institute of Technology.

Twenty-eight kelp beds formerly existed in the three southernmost coastal counties of California. They can be grouped into three categories: permanent, semi-permanent and ephemeral, based on their persistence through time. Histories of the major beds will be presented as well as factors responsible for year-to-year fluctuations. Occurrences of El Niño and La Niña events are of prime importance and usually affect all beds, regardless of size, location and persistence. My own ideals will be offered regarding priorities for future research. Ecology of the microscopic phases in the *Macrocystis* life cycle is poorly understood and is important among studies needed.

### 34 AN OVERVIEW OF THE KELP BEDS OF ORANGE AND SAN DIEGO COUNTIES IN 1999 (WITH A REVIEW OF THE KELP BEDS FROM 1983 TO 1998)

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Kelp beds in Orange and San Diego Counties reached their maximum extent in several decades during the cold-water La Niña years of 1989-1990. Following that, an El Niño in 1991-1993 severely affected the kelp resources once again. After what was to be only a short-lived recovery, they were again adversely affected in 1994 by anomalously warm water that was not related to the El Niño phenomenon. A recovery began in 1995 and conditions were more or less stable through 1996. But, by 28 May 1997, another El Niño had formed and seriously devastated the kelp beds. At its peak, this El Niño proved to be as great as that of 1982-83 in its effect on the kelp bed resources.

Each of the 24 kelp beds of Orange and San Diego County were monitored during these anomalous events by the means of color aerial infrared photographs taken on a quarterly basis. These photographs were taken under as close to similar conditions as possible. From these photographs, the greatest areal extent of each of the separate kelp canopies was determined for each year. 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 is relatively easy to determine whether the bed in question is responding to an area wide event, or if it is atypical of the beds in the region. This then becomes a very cost-effective tool to determine where to focus additional concentrated efforts on beds that may be responding atypically.

### 35 PATTERNS AND CONSEQUENCES OF SPORE DISPERSAL IN GIANT KELP, *MACROCYSTIS PYRIFERA*.

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We investigated patterns of spore dispersal in the giant kelp *Macrocystis pyrifera* by collecting 80 independent measurements of spore dispersal from isolated individuals and isolated groups of individuals over a two year period. Our results indicate that giant kelp spores routinely disperse both short (i.e. a couple meters) and long (i.e. hundreds to thousands of meters) distances depending on the oceanographic conditions. One consequence of spore dispersal over short distances is self-fertilization (i.e., fertilization between male and female gametophytes derived from the same sporophyte). Field experiments designed to test the effects of self-fertilization on lifetime fitness in *Macrocystis* revealed significant inbreeding depression. Birth rates in self-fertilized populations were ~ 50% of those produced from outcrossing, which lead to significant differences in cohort size that persisted up through the adult stage. In contrast to outcrossed populations, very few individuals produced from selfing became reproductively mature, and those that did were significantly less fecund than outcrossed individuals. By contrast, longer range dispersal of spores leads to increased rates of outcrossing. However, long range dispersal is typically accompanied by massive dilution of spores, leading to low densities of spore settlement. Sparse spore settlement decreases the overall chance of fertilization in the microscopic gametophyte generation thereby reducing the potential for colonization of the macroscopic sporophyte stage. Large population size of adult sporophytes coupled with the synchronous release of spores in response to environmental cues can help offset the effects of spore dilution and extend the distances over which giant kelp is able to colonize.

### 36 EL NINO 1997-98: LARGE-SCALE PATTERNS OF DISTURBANCE AND RECOVERY IN GIANT KELP FORESTS.

M. S. Edwards, Department of Biology, University of California, Santa Cruz, CA 95064

How did the giant kelp forests along central California fare during El Niño 1997-98 compared to other oceanographic regions? I studied variability in giant kelp forests at 84 sites along California, USA and Baja, Mexico to identify the spatial scale at which the El Niño-driven storms affected giant kelp populations. These sites spanned the geographic range of giant kelp *Macrocystis pyrifera* in the Northeast Pacific and were surveyed for kelp density and population size structure just before, immediately following, several months after, and more than one year after the El Niño event. Interspersion of survey sites allowed the effects of this event to be compared among spatial scales ranging from meters to thousands of kilometers. Variance components analyses were used to identify the spatial scale at which giant kelp populations were most affected during, and recovered following the El Niño. This event shifted the relative importance of those factors regulating *M. pyrifera* density from those acting at small (a few meters) to very large (hundreds to thousands of kilometers) scales. *M. pyrifera* populations in Baja and southern California were severely to completely depleted, while populations in central California were relatively unaffected. Recovery of *M. pyrifera* was scale-dependent and differed among geographic regions. Here I present results of these analyses, compare the disturbance effects among oceanographic regions, and relate the observed patterns to large-scale El Niño-driven oceanographic conditions.

### 37 DISPERSAL PROCESSES, LOCAL HABITAT FEATURES, AND PATTERNS OF NEARSHORE REEF FISH ASSEMBLAGES WITHIN THE CALIFORNIAN BIOGEOGRAPHIC PROVINCE

D.M. Schroeder, Marine Science Institute, University of California, Santa Barbara, CA 93106

Two dramatic headlands, Point Conception and Punta Eugenia, define the boundaries of the Californian biogeographic province. If these headlands act as “biogeographic breaks” that limit reef fish dispersal or other demographic rate, we would expect sharp differences in fish abundance and community structure associated with these topographic features. To test this hypothesis, we performed a large scale survey of nearshore reef fish assemblages on 39 reefs distributed across the entire province and south of Punta Eugenia. Neither headland marked an abrupt change in population densities of common fishes or in community structure. Instead, ordination analysis revealed that Punta Canoas, a headland approximately 130 km north of Punta Eugenia, delineated a shift in reef fish community structure.

Reef fish communities appeared to cluster together based on local temperature or oceanographic features. Mechanisms traditionally used to explain community structure at small scales (e.g. predator or macroalgae density) did not explain large scale patterns. Near the Point Conception region, a five year, nine reef study of reef fish populations suggests that adult dispersal plays a critical role in the dynamics reef fish communities. Thus, the response of reef fish communities to oceanographic regime shifts may be faster and less persistent than previously thought.

#### 38 THE NEARSHORE FISH ASSEMBLAGE OF SANTA CATALINA ISLAND.

D. J. Pondella, II<sup>1</sup> and Larry G. Allen<sup>2</sup>. <sup>1</sup>Vantuna Research Group, Los Angeles, CA 90041, <sup>2</sup>Nearshore Marine Fish Research Program, Department of Biology, California State University, Northridge 91330-8303.

The nearshore fish assemblage of Santa Catalina Island was monitored from 1996-98 as part of the Ocean Resource Enhancement Hatchery Program (OREHP), California Department of Fish and Game. A stratified random design was used to sample fishes with overnight gill nets, set bimonthly from April-October. Fishes were surveyed on the East and West End of Catalina Island and in Catalina Harbor. Concomitant with this survey, seven coastal sites from Santa Barbara to Newport were surveyed as a comparison. Despite of the proximity of the island to the mainland, an analysis of diversity, abundance, richness, and biomass of the nearshore fishes found Catalina Island's ichthyofauna to be functionally different from that of the mainland. This survey technique also found an increase in community importance for elasmobranchs based upon abundance and biomass; our results suggest that other sampling techniques are inadequate for estimating the importance of these large predatory and elusive fishes in nearshore communities.

#### 39 EL NINO 1997/98 IN THE POINT LOMA FOREST NEAR SAN DIEGO: PHYSICAL IMPACTS AND BIOLOGICAL RESPONSES

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Kelp forests, organized around the giant kelp (*Macrocystis pyrifera*), are the California benthic community most heavily affected by El Niño events. With its high nutrient requirement, kelp growth ceases and considerable tissue deterioration reduces the structure and productivity available to the rest of the community. Here we consider data from 1997 through 1999, encompassing a strong El Niño event and the transition into La Niña conditions. To assess sources of nitrate, the nutrient that limits kelp growth, we deployed a cross-shore array of thermistors to investigate the role of internal waves. We monitored runoff during two sharply contrasting rainy seasons and assessed accumulation in sediments susceptible to wave dispersal as alternate nutrient sources during El Niño periods when the thermocline is depressed below kelp forest depths. The effects of these nitrogen sources were evaluated with regular surface and bottom nutrient measurements and CHN samples of kelp tissues on a cross-shore transect through the forest. Biological responses, which varied with the sources of the nitrogen and depth and position in the forest, will be discussed in the context of long-term observations of kelp and invertebrate population dynamics at these sites.

#### 40 BIOGEOGRAPHIC AND ECOLOGICAL IMPLICATIONS OF KELP RAFTING AS A DISPERSAL VECTOR FOR MARINE INVERTEBRATES.

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Islands represent discontinuous habitat for terrestrial taxa yet it is less obvious that they are also "biological islands" for certain marine species as well. Intertidal and subtidal marine invertebrates, especially those which lack a meroplanktonic larval stage, may face significant difficulty in crossing biogeographic barriers such as the San Pedro Channel. Taxa which are asexual, brood their young or have "crawl away" juveniles may have significantly lower inherent dispersal ability, yet are often well-represented and exhibit relatively low rates of endemism on islands. Kelp such as *Macrocystis* and *Pelagophycus* provide habitat for numerous marine species. Upon detachment from the substrate, kelp plants drift with the wind and currents, dispersing large numbers of individuals from many taxa over relatively long distances. This mechanism may assist in maintaining these species' geographic ranges as well as increasing genetic exchange between isolated populations. Marine species so dispersed have a high potential for reproductive establishment upon arrival due to the numbers transported, age structure, reproductive status and genetic diversity of the propagules. Of ecological interest is the potential simultaneous introduction of commensals, symbionts, parasites and predators. Colder ocean temperatures following the last glacial period in addition to historic reductions of kelp due to sea otter hunting, kelp harvesting and other anthropogenic activity suggest kelp may have had an even more significant role in the past.



41 ASSESSING THE EFFECTS OF DIVE FISHING ON EXPLOITED POPULATIONS OF MARINE INVERTEBRATES USING LONG-TERM MONITORING DATA COLLECTED IN PROTECTED AND UNPROTECTED AREAS IN SOUTHERN CALIFORNIA

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We used long-term monitoring data from the kelp forest community in the Santa Barbara Channel Islands National Park and San Nicolas Island to evaluate the possible effects of dive fishing on the warty sea cucumber (*Parastichopus parvimensis*). Densities of this species have been estimated annually and information on size distributions have been collected sporadically over the last 17 to 19 years at 21 sites separated by distances ranging from 1 to 200 km. Two of the sites were set aside as no take reserves in 1978 and there have been no restrictions on fishing at the other 19 sites. Twelve to fourteen surveys were conducted before and five after the fishery began. The effects of fishing on populations of sea cucumbers were estimated using a modified Before After/Control Impact or BACI analysis. Impacts were also determined using fishery dependent data on catch per unit effort and yield. The impacts of fishing estimated from fishery dependent data were compared to those estimated using fishery independent data in the BACI analysis. BACI analyses show significant reductions (40% to 80%) in sea cucumber densities for some of the fished sites, which were highly correlated with cumulative catch, the fishery dependent measure of impact. As well as providing useful information on an exploited fishery, our study offers a case study in the use of marine protected areas as tools for evaluating the impacts of fishery of other human impacts on marine populations.

42 ASPECTS OF THE ECOLOGY OF WHITE ABALONE, *HALIOTIS SORENSENI*

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White abalone, *Haliotis sorenseni*, is an abalone found on deep (30-60 m) rocky reefs in southern California and Baja California, Mexico. It was once the subject of a lucrative but short fishery, which collapsed in the late 1970s. Concern for the continued existence of white abalone resulted in its designation as a candidate species by NMFS under the Endangered Species Act. One difficulty in assessing white abalone is the scarcity of information about where it is found. During a 16-day cruise in October 1999, using the research submersible DELTA to assess populations, we collected details of the ecology and distribution of the white abalone found. A total of 157 white abalone were found during 94 hours of sub diving. We found an overall density of about six white abalone ha<sup>-1</sup>, though the numbers varied considerably between islands and offshore banks with the highest concentrations at the most remote sites. This compares with density estimates of 800-4000 abalone ha<sup>-1</sup> in the 1970's. Sustainability at these population levels seems unlikely. To preserve the species, plans are being made for captive breeding and grow out at UCSB and the Channel Islands Research Institute, a non-profit aquaculture facility. The overall poor condition of abalone populations in southern California was reflected in the closure of all abalone take south of San Francisco in 1998. We need to continue monitoring the ecosystem and learn from this example or more marine species will be in danger of extinction.

43 DO SOUTHERN CALIFORNIA HARVEST REFUGIA ENHANCE TARGET FISH POPULATIONS?

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Abstract available from Author

44 UNDERSTANDING THE URBAN INFLUENCE ON SANTA MONICA BAY: AN OVERVIEW.

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Santa Monica Bay, an open coastal embayment adjacent to the greater Los Angeles metropolitan area, extends from Point Dume to Palos Verdes Point. Approximately 50,000,000 tourists and local residents visit the beaches annually to swim, surf, sunbathe, sportfish, and harvest shellfish. Other beneficial uses include commercial fishing,

aesthetic enjoyment, and protection of marine habitats, including habitats for rare and endangered species and for fish nurseries. During the past 100 years, the Bay has been subjected to numerous environmental stressors, including dramatic changes in population size, land use, surface runoff, and municipal and industrial waste disposal practices. Presently, Santa Monica Bay has many point sources and nonpoint sources that add to an existing reservoir of contaminants buried in the sediment from prior pollution. An integrated picture of how current influences on Santa Monica Bay water quality interact with historical sediment impacts, information essential for making effective management decisions, is lacking. In response, the Southern California Coastal Water Research Project, the US Geological Survey, and the City of Los Angeles began a multi-disciplinary study of Santa Monica Bay sediments in 1997 to provide information needed to identify and develop remediation strategies. Most of the papers in this session are the result of this collaborative, multi-perspective investigation, which addresses the severity of present contamination conditions, how levels of contamination have changed over the last 100 years, the biological response to the contamination, and the processes responsible for transporting and modifying sediment and contaminants.

#### 45 SUBMARINE GEOMORPHOLOGY OF SANTA MONICA BAY FROM MULTIBEAM MAPPING

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The broad scale geomorphology of Santa Monica Bay has been known since the pioneering work of K.O. Emery. Emery and his successors interpreted submarine geomorphology from sparsely spaced single-beam echo sounder lines. Water depths were compiled, contour lines were hand-drawn, and the large-scale geomorphic features emerged. In the almost four decades since the publication of that work, little has been added to the understanding of the geomorphology because the seafloor-mapping tools have remained essentially unchanged from Emery's day. However, with the introduction of high-resolution multibeam mapping systems in the mid 1990s, a revolutionary new type of mapping system became available for shelf and slope depths. Now, instead of interpolating between a series of survey tracks, the entire seafloor can be imaged and virtually no interpolation is required to produce the detailed physiographic surface. An equally revolutionary development occurred along with the ability to map the bathymetry; calibrated acoustic backscatter from multibeam systems.

The USGS mapped the entire Santa Monica Bay between the 20- and 800-m isobaths using a multibeam mapping system in 1996. The submarine geomorphology of Santa Monica Bay can be subdivided into six physiographic provinces principally defined by water depth and gradient. The provinces include shelf, marginal plateau, slope, submarine canyon, sediment apron, and basin. Some of the most surprising discoveries are (1) the sinuous nature of Redondo Canyon compared to the linear nature of Santa Monica Canyon, (2) the relative scarcity of debris-flow deposits, and (3) a large sediment apron that has buried the slope.

#### 46 COASTAL OCEANOGRAPHIC CONTROLS ON SPATIAL AND TEMPORAL VARIATIONS IN HOLOCENE SEDIMENT ACCUMULATION, SANTA MONICA BAY

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Seafloor deposits of Santa Monica Bay, southern California margin, are an important archive of variations in sediment dispersal and accumulation associated with climate, sea level, and circulation on decadal-millennial time scales. This sedimentary record is valuable to investigations of anthropogenic impacts on land-ocean sediment fluxes and the fate of particle-associated pollutants in coastal waters. To this end, we have analyzed piston cores and high-resolution seismic profiles to characterize Holocene (past 11,000 years) sedimentary processes in the Bay, with particular emphasis on sediment burial fluxes. Chronologies based on AMS C-14 dating of cores from shelf-slope sites (100-550 m water depths) were developed to estimate sediment accumulation rates and to date sub-bottom seismic reflectors. Results indicate that sedimentation rates (porosity normalized) have decreased substantially since the last glacial maximum at ~18 ka, and most abruptly around 12-13 ka. Subsequently, rates were 0.4-1.0 mm/y 11-8 ka, decreasing to <0.1-0.5 mm/y from 7 ka to present. Concomitant changes in sediment properties (internal structures and grain size) and seismic reflection patterns evince a transition from gravity-induced to hemipelagic sedimentation in the Bay beginning around 13 ka. The magnitude of early Holocene sedimentation rates can be attributed to manifestations of regional climatic conditions including: (1) higher rainfall intensities, watershed sediment yields, and coastal sediment delivery; and (2) lower sea level, which favored slope-basin over shelf-centered deposition. In sum, our findings indicate that bayfloor accumulation rates have varied temporally, to within a factor of 10, in response to external (climate) and internal (oceanic circulation) processes.

#### 47 DISPERSAL AND ACCUMULATION OF MODERN SEDIMENTS ON THE SANTA MONICA SHELF AND SLOPE

C. Alexander<sup>1</sup>, C. Sommerfield<sup>2</sup> and H. Lee<sup>3</sup>. <sup>1</sup>Skidaway Institute of Oceanography, Savannah, GA 31411, <sup>2</sup>Woods Hole Oceanographic Institution, Woods Hole, MA 02543, <sup>3</sup>United States Geological Survey, Menlo Park, CA 94025

Sedimentary processes on the Santa Monica Bay (SMB) margin are being studied to understand dispersal pathways of both natural and anthropogenic materials. A suite of 83 box cores collected from 50-800 m water depth were analyzed for <sup>210</sup>Pb geochronologies, biological mixing rates, sediment texture and sedimentary structure to delineate transport trends on 100-y timescales. Sediment input to SMB appears to be associated with at least two point sources on the shelf, with Malibu Creek and the Hyperion sewage outfall being the most significant. Sediment contributions are sufficient to support apparent mass accumulation rates near these sources up to ~2 g/cm<sup>2</sup>y, which with distance decrease to ~0.3 g/cm<sup>2</sup>y near the shelf break (~100 m water depth). Sequestering of material on the shelf and decreasing sediment supply to the slope is evident as rates decrease between 100-200 m water depths to ~0.2 g/cm<sup>2</sup>y. Below ~200 m water depth, rates are relatively slow and similar (0.06-0.13 g/cm<sup>2</sup>y). This similarity in rates over such a broad extent suggests that hemipelagic sedimentation is the dominant mechanism of sediment delivery in water depths >200 m. These slower rates are in general agreement with rates determined on the flanks of the California Borderland basins. <sup>210</sup>Pb rates on the shelf and upper slope are significantly more rapid than <sup>14</sup>C rates determined for these areas. Biological/physical sediment mixing or downcore textural changes may be responsible for this discrepancy. Geochemical modeling of <sup>210</sup>Pb and <sup>137</sup>Cs profiles and textural analyses constrain the importance of these factors and will be discussed.

#### 48 BENTHIC INFAUNAL BIOTURBATION EFFECTS ON SEDIMENT MIXING RATES IN SANTA MONICA BAY, CALIFORNIA.

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Sediment mixing may be an important determinant of contaminant availability to food webs. We examined relationships between benthic infaunal species abundances and sediment mixing rates in Santa Monica Bay to identify organisms responsible for mixing in bottom sediments. Benthic infauna and sediment mixing rates were measured at 25 sites in Santa Monica Bay in July 1997. Infaunal species abundances and their distributions beneath the sediment surface were determined from grab samples, cores, and x-radiographs. Pb-210 mixing depths, Th-234 penetration depths, and Th-234 mixing rates were measured in the cores. The Th-234 data suggest that bioturbation is the primary mechanism involved in sediment mixing on the 3-month time scale; Th-234 penetration depths were 30-mm to 60-mm although values less than 1-mm would be expected if the only mechanism available was sediment accumulation at the known rate of 1-2 mm per year. We will classify our sites in terms of sediment mixing intensity over 100-year (Pb-210) and 3-month (Th-234) time scales and use univariate and multivariate statistical analyses to determine whether any abundant organisms are associated with high mixing rates. Our data and x-radiographs will also be examined for evidence that large, low abundance, low collection probability organisms are associated with high mixing rates on either time scale.

#### 49 CHARACTERIZING BENTHIC HABITATS OF SANTA MONICA BAY BY BOTTOM PHOTOGRAPHY

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Bottom photographs and seafloor video images collected during three cruises offshore Los Angeles, CA, document variations in the character of seafloor sedimentary facies and rock environments within Santa Monica Bay. The images, collected at discrete locations by use of a bottom-trip camera attached to a box corer as well as along transects by use of a towed camera/video sled, were taken from the innermost shelf (10 m) to the floor of the adjacent Santa Monica Basin (850 m). These data, coupled with textural information as well as multibeam bathymetric and backscatter imagery, document variations in benthic habitat throughout the region. The photographic images also provide insight into the processes that influence transport and distribution of sediment in the region.

Potential benthic habitats characterizing the region include: 1) low-relief sediment ripple fields in nearshore areas, 2) an extensive region of sediment-starved rock outcrop, 3) mud-rich environments occupying much of the mid-shelf, outer-shelf, mainland slope, and basin floor, and 4) organic-rich muds near the Hyperion outfall diffusers. The complex region of exposed bedrock with locally high relief likely provides suitable habitat for many benthic species of rockfish. Open burrows, tracks and trails on the seafloor, and photographs of epifauna interacting with the seafloor document both the existence of robust infaunal and epifaunal communities in mud-rich settings as well as the potential for biogenic mixing of near surface sediment and associated nutrients and contaminants.

#### 50 SPATIAL DISTRIBUTION OF SURFICIAL GRAIN SIZE

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Maps that provide geographic reference for data are essential tools for investigation and communication. The extension of sample data over an area of interest, to view gradients and patterns, requires modeling techniques. There are various modeling techniques that have not been compared for marine sediments. I compare three methods of modeling grain size, characterized by percent fines (< 63  $\mu$ ), in Santa Monica Bay, CA; triangulation, kriging based on the variogram of percent fines, and co-kriging based on variograms of percent fines and depth and their cross-variogram. I used southern California Bight Pilot Project (1994) and USGS (1997, 1998) data to develop models and City of Los Angeles routine monitoring data (1996) for validation. I detrended the data using latitude and longitude to assure stationarity and isotropy before modeling the variograms. I compared the predictions to the validation data using average difference and average absolute difference. All methods had average absolute difference from the truth of less than 9%, and average (signed) difference of less than 13%, although all were positively biased. Co-kriging differences were less than triangulation and kriging. Triangulation results were unreliable, being sometimes less than 0% or greater than 100%. Co-kriging improved the maps visual appeal over kriging by closely matching known characteristics of Santa Monica Bay's shelf and canyons. The average absolute difference for co-kriging was equal to the annual and biennial absolute difference observed at City of Los Angeles routine monitoring stations from 1987 to 1995.

#### 51 TEMPORAL AND SPATIAL DISTRIBUTIONS OF ORGANIC POLLUTANTS AND TRACE METALS IN SEDIMENTS OF SANTA MONICA BAY, CALIFORNIA.

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Santa Monica Bay has been subjected to waste discharge from numerous sources. Existing data indicate that contaminant inputs from waste water discharge, a major source of contamination to SMB, have declined drastically during the last three decades as a result of improved treatment processes and better source control. The temporal changes in the SMB sediment conditions, however, have not been examined adequately. We initiated a study in June of 1997 to address this issue. Twenty-five box cores were collected using a probability-based sampling design; five sediment strata corresponding to the time periods of 1900 (pre-industrial), 1945, 1970, 1985, and 1997 were identified and sediment samples from these strata were analyzed for DDT compounds (o,p'- and p,p'-DDT, DDD, and DDE; designated as DDTs thereafter), polychlorinated biphenyls, polycyclic aromatic hydrocarbons, linear alkylbenzenes, total organic carbon, and trace metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc, and iron). The highest concentrations of individual pollutants mostly occurred at the time period of 1970. However, contaminants remained abundant at the top sediment layers near the Hyperion Treatment Plant (HTP) 7-mile outfall, even though the operation of this outfall ceased in 1987. This indicated that historically deposited chemicals were remobilized upward within the sediment column. The magnitude of sediment contamination in SMB were also assessed using the effects range-low (ERL) and effects range-median (ERM) for DDTs, PCBs, and PAHs.

#### 52 TOXICITY OF SEDIMENT CORES FROM SANTA MONICA BAY

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During the summer of 1997, sediment core samples were taken at 25 stations in Santa Monica Bay. The toxicity of 4 cm sections of the entire length of each core was measured using two methods: a purple sea urchin (*Strongylocentrotus purpuratus*) fertilization test of water overlying the sediment and an amphipod (*Grandidierella japonica*) survival test of bulk sediment. Surface sediments were toxic to sea urchins at two stations located near the former sludge outfall for the Hyperion wastewater treatment plant. Sea urchin toxicity was also detected in subsurface sec-

## 58 IMPACTS OF THE LOS ANGELES AND SAN GABRIEL RIVERS ON THE COASTAL OCEAN - OBSERVATIONS FROM A LA NIÑA YEAR 1998-99

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The Los Angeles and San Gabriel Rivers are the largest drainage systems in Los Angeles. During most of the year the flow in both systems is relatively low, but during winter rain events, significant runoff results in large flows from both rivers entering the coastal ocean through the ports of Los Angeles and Long Beach. Results are compared from October prior to the onset of winter rains, and from a rain event in January 1999. During wet weather study we observed significant freshwater plumes from the Los Angeles and San Gabriel Rivers. The presence of runoff plumes was immediately evident in salinity and turbidity (beam attenuation). Because this was a relatively dry year, and the rain event was not large, the influence of the plumes extended only a limited distance offshore and only a few meters down into the water column from the surface. The data presented shows that the plumes are advected alongshore from the source due to coastal currents, expanding the area of impact beyond the mouths of the rivers. Evidence from other studies in the region indicate that after the particulate material from the runoff has settled from the system, the fresher nearsurface runoff plume remains high in particulate material due to the blooming of phytoplankton in the surface ocean affected by the stormwater runoff. It is clear from this study that major outflows during a moderate rain event are primarily associated more with urban runoff systems where there is more surface hardening within the watershed.

## 59 SHELF-BREAK PROCESSES IN SANTA MONICA BAY

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Santa Monica Bay is an urbanized section of coastal ocean that has complex topography, sediment-distribution patterns, and oceanographic processes. In 1996, the US Geological Survey and cooperating agencies began a multi-element program to examine sediment and contaminant transport processes in the bay. Sediment-distribution maps show that the mid-shelf is covered with a layer of Holocene and recent sandy mud. Cores and acoustic backscatter images indicate that the sediment cover largely disappears near the shelf break immediately north of Santa Monica Canyon, but extends over the shelf break farther northwest of the canyon. Instruments deployed in the winter of 1998/99 on the inner shelf and near the shelf break immediately north of the canyon show that strong current pulses occurred near the bed over the shelf break, primarily during spring tides. Near-bed current amplitudes reached speeds of 30-40 cm/s; current directions were primarily offshore. Occasionally, the entire overlying water column became well-mixed, then re-stratified; suggesting strong fronts were being advected past the instruments. At an inshore site, the strong current pulses were much rarer and of lower amplitude. The current pulses at the shelf break were large enough to resuspend and transport sediment, and may explain the observed sediment distributions. Sediment-transport processes will be enhanced if large waves associated with winter storms or swell occur during spring tides. Our recent investigation focuses on the processes that cause these strong current pulses and their role in sediment-transport processes at the shelf break.

## 60 CLAY MINERAL SUITES IN SANTA MONICA BAY

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Clay mineralogy is useful in determining the distribution, sources, and dispersal routes of fine-grained sediments, and current patterns can be inferred from that information. Fifteen surface-sediment samples from Santa Monica Bay were analyzed for clay minerals. The less-than 2 m-size fraction was isolated and Mg-saturated and glycolated before analysis by X-ray diffraction. Semi-quantitative percentages of smectite, illite, and kaolinite plus chlorite were calculated using 001 basal-peak areas and standard weighting factors. The mean clay-mineral suite for Santa Monica Bay is 50% smectite, 32% illite, and 18% kaolinite plus chlorite. However, smectite contents vary within 24 percentage points (39-63%), illite within 19 points (20-39%), and kaolinite plus chlorite within 13 points (12-25%). These are relatively large variations for such a small geographic area and indicates that there are several sources for the clay minerals in the Bay. The clay-mineral suites roughly group into three geographic areas, the SE Bay and near-shore east Bay, the area north of the Hyperion outfall, and the NW Bay adjacent to the Santa Monica Mountains. The

entire north Bay is smectite-rich relative to the south Bay, which has more abundant illite and kaolinite plus chlorite contents. The possible sources of clay minerals are rivers draining the Santa Monica Mountains, creeks draining the L.A. basin, such as Malibu and Ballona Creeks, erosion of the Palos Verdes Headland, and the Hyperion sewage outfall in the central bay. Samples have been obtained from all those potential sources and are being analyzed to determine the dominant sources for the offshore clay-mineral suites.

61 HEAVY MINERALS OF SAND-SIZED SEDIMENT, SANTA MONICA BAY

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Heavy minerals in very fine and fine sand (63-250 $\mu$ m) from beach and shelf sites off the Palos Verdes Peninsula on the southern part of Santa Monica Bay distinguish effluent-affected sediment from unaffected deposits, and track the sediment contributed by the historic Portuguese Bend landslide. Heavy minerals also identify inhomogeneous sediment sources for the nearshore zone and relate outer-shelf sediment to depositional cells north and south of the area.

Factor analysis of the heavy-mineral data identifies several depositional provinces in the Palos Verdes margin that are non-overlapping at a factor loading of 0.6 or more. Province 1 is concentrated on the outer shelf and has the regional mineralogic signature of shelf sediment collected between Los Angeles and the U.S./Mexico border (hornblende, epidote, sphene, apatite); these minerals point to sources in the Transverse and Peninsular Ranges of southern California. Province 1 represents the sediment unaffected by effluent. The subset of beach and nearshore samples in southern Santa Monica Bay are characterized in part by Province 1 minerals and show other local variability. Province 2 is characterized by titanian augite and tracks the advance of sediment shed from the Portuguese Bend landslide in a band 2 km cross-shelf by 10 km along the coast. Province 3 represents the lower-density effluent-affected deposit and consists of samples with regional mineralogy (province 1) modified by components such as mica and carbonate fragments. Samples to be examined from central Santa Monica Bay will likely show other regional and local variability

62 NEW AND UNUSUAL INVERTEBRATES DISCOVERED AT THE CALIFORNIA CHANNEL ISLANDS DURING THE 1997-1998 EL NIÑO

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The occurrence of new and unusual warm-water invertebrates at the eight California Channel Islands was documented for the 1.5 yr El Niño period (5/97-8/98) and subsequent 1.5 yr La Niña period (9/98-2/00) during periodic shallow subtidal survey cruises for the Tatman Foundation Channel Islands Research Program and Channel Islands National Park Kelp Forest Monitoring Program, along with records provided by others. Despite 20 years of prior surveys, 11 conspicuous invertebrate species (1 cnidarian, 1 annelid, 2 arthropods, 5 mollusks, and 2 echinoderms) were newly recorded at one or more islands. Eight represent first occurrences in California, providing considerable northward range extensions. Most new records occurred at the southernmost islands of Santa Catalina and San Clemente. Some warm-water invertebrates, occasionally or typically found at southern islands, became more abundant and expanded their range to northern islands. Other invertebrates, including certain herbivores, planktivores, and seastars, incurred high mortality during El Niño, likely due to thermal stress, reduced food availability, or disease. This exceptional El Niño occurred within the context of more than two decades of above average seawater temperatures since 1976. Our long-term surveys indicate that warm-water species have gradually replaced cold-water species from southeast to northwest at the 8 Channel Islands. This process was accelerated during the 1997-1998 El Niño, as northerly-flowing warm currents brought new tropical larvae to southern California. Survivorship of these warm-water exotic species will be discussed, especially with regard to the extraordinary cold-water La Niña period that immediately followed El Niño.

63 NORTHERN RANGE EXTENSIONS INTO THE SOUTHERN CALIFORNIA BIGHT OF TEN DECAPOD CRUSTACEA RELATED TO THE 1991/92 AND 1997/98 EL NIÑO EVENTS

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The first recorded appearance in the Southern California Bight (SCB) of ten decapod crustaceans which share distributions that are primarily tropical or sub-tropical is documented. Northern range extensions are provided for the penaeidean shrimp *Metapenaeopsis mineri* (Penaeidae) and *Sicyonia penicillata* (Sicyoniidae), the caridean shrimp *Processa peruviana* (Processidae), *Pantomus affinis*, *Plesionika beebey*, *P. trispinus* and *P. carinirostris* (Pandalidae)

and the brachyuran crabs *Stenorhynchus debilis* (Majidae) *Palicus cortezi* and *P. lucasii* (Palicidae). These animals were collected during or in the aftermath of the 1991/92 and 1997/98 El Niño events. Most of the specimens were collected in trawl monitoring programs in place for up to three decades. These long term data sets provide evidence of previous absence from the SCB accentuating the novelty of these records.

#### 64 MULTIPLE MECHANISMS ALTER THE GEOGRAPHIC RANGE OF COASTAL MARINE INVERTEBRATES.

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We report recent range extensions or revisions for 12 species of intertidal or shallow subtidal marine invertebrates (11 mollusks and 1 ophiuroid) along the California coast. Ten range extensions were northward and two southward. We consider six potential mechanisms causing these range extensions: 1) climate change; 2) El Niño Southern Oscillation (ENSO) events; 3) thermal refugia; 4) search artifacts; 5) anthropogenic effects; and 6) unpublished data. Search artifacts account for the discovery of seven extralimital species, anthropogenic thermal refugia facilitated two extensions, and the 1997–98 ENSO transported only one species beyond its typical northern limit, although previous ENSO events presumably contributed to the remaining northward extensions. Additionally, unpublished museum material further extended the range endpoints of six species. While climate change and global warming are consistent with patterns of northward expansion, and 10 of 12 species did expand northward, we suggest that other mechanisms can also explain both ephemeral range anomalies and long-term range expansions.

#### 65 SHIFTS IN FISH AND INVERTEBRATE ASSEMBLAGES OF TWO SOUTHERN CALIFORNIA ESTUARIES DURING THE 1997-98 ENSO.

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Estuarine fish and invertebrate assemblages exhibited changes during the 1997-1998 El Niño event at Tijuana Estuary (TE) and Los Peñasquitos Lagoon (LPL) that were likely related to ocean anomalies (altered currents modifying larval supply) and increased rainfall in the watershed (disturbance from flooding and sedimentation). One group included species with warm-water affinities that were rare or new to the monitoring record at each estuary: *Albula vulpes* (bonefish) leptocephalous larvae, *Ctenogobius sagittula* (longtail goby), the nonindigenous *Acanthogobius flavimanus* (yellowfin goby), *Callinectes arcuatus* (arched swimming crab), juvenile *Peneaus californiensis* (yellowleg shrimp), and a bivalve, *Petricola hertzana*. Persistence of these species appeared to be influenced by the longevity of individuals that recruited during 1997-98. Another group included species that were common in the monitoring record, yet exhibited a substantial change (increase or decrease) in historic abundance and/or size-frequency. High densities of YOY *Mugil cephalus* were collected, whereas prior samples were dominated by adults. At TE, we observed a spectacular peak in abundance of the exotic amphipod *Grandidierella japonica*, while *Tagelus californiensis*, a long-time dominant bivalve, exhibited substantial declines. We suggest several likely mechanisms for the patterns observed, including altered larval supply, habitat disturbance, predation, and competition. Biological monitoring programs have been in place at TE and LPL since the mid-1980's, providing valuable baseline data that allows identification of changes associated with large-scale climatological events.

#### 66 FISH POPULATION FLUCTUATIONS 1996-2000 IN LAGOONS ON MARINE CORPS BASE CAMP PENDLETON

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Eight coastal lagoons on MCB Camp Pendleton (San Diego County) were intermittently sampled from 1996 to 2000. Seven of the lagoons are small, averaging <1-2 ha, but the Santa Margarita River lagoon is about 20-30 ha. Average depths are usually less than 1 m, with greatest depths between 2-3 m. The small lagoons are typically dominated by tidewater gobies (*Eucyclogobius newberryi*) and mosquito fish (*Gambusia affinis*). The Santa Margarita has a more diverse estuarine fauna despite being closed to the ocean for much of the year. Major El Niño effects were invasions of longtail gobies (*Ctenogobius sagittula*), and blue Crabs (*Callinectes*) which did not appear to survive the following winter. The smaller lagoons acquired a larger-diversity of estuarine invaders, particularly yellowfin gobies (*Acanthogobius flavimanus*), striped mullet (*Mugil cephalus*) following El Niño rains. Two normally intermittent or hypersaline lagoons developed diverse fish faunas. Some systems are reverting to historic conditions, and

some maintained lower salinity conditions and more diverse fish faunas. Like brackish water systems elsewhere, stochastic processes rather than biological interactions seem to be determining the changes in these depauperate fish communities.

67 FIRST RECORDS OF MEXICAN BARRACUDA (*SPHYRAENA ENSIS*) IN SOUTHERN CALIFORNIA WITH NOTES ON SCALLOPED HAMMERHEAD (*SPHYRNA LEWINI*) AND PACIFIC SIERRA (*SCOMBEROMORUS SIERRA*).

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Abnormally warm waters in southern California during the 1997-98 El Niño event brought changes to the local ichthyofauna. Five Mexican barracuda, which normally range from Bahia Magdalena (Central Baja California) to Panama, were collected between October 1997 and September 1998. Additionally, a school of six was photographed in spring 1998. This represents a range extension of over 1000 km for this species. Mexican barracuda can be distinguished from its eastern Pacific relatives (*S. argentea*, *S. idiaestes*, and *S. lucasana*) by the origin of the pelvic fins, length of the maxillary, and the presence of dark bars. The scalloped hammerhead has been previously reported from southern California, although they are rare. Nine were caught in the warmest and most turbid area of San Diego Bay between October 1997 and June 1999. Five, ranging in size from 418 to 475 mm FL, were caught together in a gillnet and each possessed an umbilical scar, which is further evidence that this species may pup locally. The Pacific Sierra, an infrequent visitor, has been reported to La Jolla. Several were captured between October 1996 and August 1998, and anecdotal information indicates that large numbers were present off Long Beach during the 1982-84 El Niño event.

68 NOTES ON THE ADDITION OF THE PACIFIC CORNETFISH *FISTULARIA CORNETA* TO THE SOUTHERN CALIFORNIA BIGHT FAUNA AND RELATED NOTES ON OTHER RARE FISH AND INVERTEBRATES OBSERVED DURING THE 1997-1998 EL NIÑO (WITH SOME EARLIER UNREPORTED COLLECTIONS).

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During the late spring of 1998, on 7 May 1998, two small cornet fish were taken from the cooling water screenwell inside of the former Southern California Edison's Huntington Beach Generating Station (now AES Huntington Beach), in Huntington Beach, California. These were initially thought to be the reef cornetfish *Fistularia commersoni*, however closer examination indicated that these two specimens were the Pacific cornetfish *Fistularia corneta*, a new addition to the Alta California fauna.

During this same period, on 7 September 1998, a Cortez angelfish *Pomacanthus zonipectus* was picked from the cooling water screenwell trashbaskets at the Redondo Generating Station. Although, not an addition, it serves to augment the El Niño record, as does an earlier observation (29 October 1993) while diving. Other notes on fish and invertebrates found in Southern California generating station cooling water during El Niños include the bigscale goat fish *Pseudopeneus grandisquamis*, initially added to the fauna in 1979, but again found in 1998. Several invertebrates were also taken during surveys. At San Onofre, the swimming crab *Euphylax dovii* was taken on several occasions in 1999, as was the target shrimp *Sicyonia penicillata*. Other earlier observations include a range extension for the *Caranx hippo* (1979), the addition to the California fauna of the armed grunt *Conodon serrifer* (1992), and several Pacific Moonfish *Volmer declivifrons* taken during the 1982-1983 El Niño. Several other species were also taken following the El Niño of 1982-1983 including several spiny boxfish *Ostracion diaphanum* in early 1985 and bullseye pufferfish *Sphoeroides annulatus* taken in 1998 and 1985. In addition, during the last two decades, over 100 finescale triggerfish *Balistes polylepis* have been taken from the intake waters of the various generating stations in southern California.

69 THE ADDITION OF A LIZARDFISH (SYNODONTIDAE) AND A DRAGONET (CALLIONYMIDAE) TO THE CALIFORNIA ICHTHYOFAUNA.

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The 1997/1998 El Niño brought a number of new or rare species into California waters. Among these were the calico lizardfish (*Synodus lacertinus*; Synodontidae) and sleepy (or black lipped) dragonet (*Synchiropus atrilabiatus*; Callionymidae). These eastern tropical Pacific species were collected by otter trawl in southern California during or following this El Niño. The calico lizardfish was 14.5 cm TL, and was collected on October 9, 1998 by otter trawl off San Diego at 27 m. This species previously had a range south of Guaymas, Mexico to Peru. It is known to inhabit a



wide range of habitats, including sandy bottoms. Characters distinguishing these species from other California species will be described, along with information on the biology and ecology of the species. The first identified sleepy dragonet was taken by otter trawl off San Diego as well, on January 19, 1999 at 100 m depth near the Point Loma Ocean Outfall. An additional specimen was later identified from the July, 1998 Southern California Bight Regional Survey. This individual was collected off of Santa Catalina Island. The sleepy dragonet was previously known to occur south of Bahia Magdalena, Baja California, Mexico, and is the only Callionymidae to occur in the Eastern Pacific. Factors influencing the occurrence of both these species in southern California will be discussed as well as the probability of their persistence.

70 ADDITION OF BLACKSPOT WRASSE (*DECODON MELASMA*) AND SPECKLEDTAIL FLOUNDER (*ENGYOPHRYS SANCTILAURENTII*) TO THE CALIFORNIA FAUNA

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The 1997/1998 El Niño brought a number of new or rare species into Californiawaters. Among these were the Blackspot Wrasse (*Decodon melasma*; Labridae) and Speckled Tail Flounder (*Engyophrys sanctilaurentii*; Bothidae). These eastern tropical Pacific species were collected by otter trawl in southern California during or following this El Niño. The Blackspot Wrasse were all juveniles; two were collected off Dana Point at 60 m and one off San Diego at 100 m. This is the first deepwater softbottom labrid in southern California, occurring at 40 to 160 m elsewhere in its range. The Speckled Tail Flounder, taken off San Diego at 60 m, is the first true bothid in southern California waters. This small-mouth flatfish occurs at 46 to 232 m elsewhere. Characteristics distinguishing these species from others will be described, along with information on the biology and ecology of the species. In addition, the third deepwater Bass (*Serranus aequidens*) specimen taken in California will be mentioned, as well as the first record of a right-eye longfin sanddab (*Citharichlys xanthostigma*). Factors influenceing the occurrence of these species in southern California will be discussed as well as the probability of their persistence.

71 THE FIRST SITING AND RARE OCCURENCE OF THREE SUB-TROPICAL FISHES IN SOUTHERN CALIFORNIA.

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During the extensive El Niño event of 1997-98 three sub-tropical fishes were observed and captured within King Harbor, Redondo Beach, California. The panamic sergeant major, *Abudefduf troschelii*, the three banded butterfly-fish, *Chaetodon humeralis*, and the sabertooth blenny, *Plagiotremus azaleus*, were observed along an interior break-wall at various instances during the two-year coastal warming phenomenon. The sitings represent the first occurrence of *A. troschelii* and *P. azaleus* in California waters, and marks the re-occurrence of *C. humeralis* which has been absent from the southern California fauna for more than 150 years. Information on the historical distribution of these fishes along the west coast of Baja California revealed that the siting of *P. azaleus* within Santa Monica Bay represents a substantial range extension of nearly 1450km.

72 NEW AND UNUSUAL REEF FISH DISCOVERED AT THE CALIFORNIA CHANNEL ISLANDS DURING THE 1997-1998 EL NIÑO.

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Observations of warm-water species not normally seen in California are often associated with El Niño Southern Oscillations (ENSO). The strong ENSO event of 1997-1998 was no exception. The occurrence of new and unusual reef fish at the Channel Islands was documented during shallow subtidal survey cruises for the Tatman Foundation's Channel Islands Research Program and the Channel Islands National Park Kelp Forest Monitoring Program along with records from others. Warm currents carried tropical larvae to Southern California and probably account for most of the rare sightings of individual or small groups of fish normally not found north of central Baja California (e.g. *Azurina hirundo*, *Apogon pacifici*, *Nicholsina denticulata*). Prevalence of some of these species diminished by 1999 when cold water dominated the region. A few species found only rarely, and usually at the southern islands, appeared to be spawning and expanding their ranges to more northerly islands (e.g. *Apogon guadalupensis*, *Scorpaenodes xyris*, *Chaenopsis alepidota*). Species well established at the islands but nearing the northern population limits

became more abundant at the northern islands during El Niño and juveniles were commonly observed (e.g. *Hypsypops rubicundus*, *Halichoeres semicinctus*, *Semicossyphus californica*, *Synodus lucioceps*). The role of El Niño events such as 1997-1998 in maintaining these populations will be discussed.

73 DISTRIBUTIONAL NOTES ON THE FISHES OF FIEBERLING GUYOT, WITH A DESCRIPTION OF A NEW SPECIES OF *NEZUMIA* (GADIFORMES: MACROURIDAE)

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The Japanese research vessel *Kaiyo Maru* first sampled Fieberling Guyot and several other seamounts of the Baja California Seamount Province over two decades ago. Subsequently, there have been a few more collections on the 500-m deep crest. Two grenadiers, *Malacocephalus laevis* and *Nezumia* n.sp., were the most abundant fishes reported. Other demersal fishes included the hagfish *Eptetretus deani*, the catshark *Apristurus brunneus*, the squaloid shark *Etmopterus* cf. *granulosus*, and the scorpaenids *Sebastobus altivelis* and *Sebastes* sp. The new species of *Nezumia* is described from specimens collected on the crest of Fieberling Guyot. It is distinguishable from all other *Nezumia* species chiefly on the basis of a high number of pelvic fin rays, a relatively high number of first dorsal fin soft rays, a steep blunt snout lacking scales ventrally, a relatively weak suborbital ridge, and a moderately long, thin barbel. Although possibly endemic to the Baja California Seamount Province, the new species appears to lack close relatives among the other *Nezumia* species of the eastern North Pacific Ocean. The strong numerical dominance of the Fieberling fish fauna by *M. laevis* and *Nezumia* n. sp. is somewhat unusual because of the proximity of this seamount to the continental slope. The global distribution of *M. laevis* outside the eastern North Pacific Ocean, and the evident lack of close relatives of *Nezumia* n.sp. in the region, suggests that both species might be extralimital to the eastern North Pacific Ocean.

74 LONG TERM TRENDS IN UNUSUAL OCCURENCES: HOW UNUSUAL IS UNUSUAL?

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Abstract available from Author.

75 STORMWATER MONITORING UNDER THE LOS ANGELES COUNTY NPDES MUNICIPAL STORMWATER PERMIT

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As the principal permittee of the Los Angeles County NPDES Municipal Stormwater Permit, the L.A. County Department of Public Works is responsible for one of the most comprehensive water quality monitoring programs of any municipal stormwater program in the country. The program features water quality monitoring of storm and dry weather flows from both mass emission and land-use specific drainage areas, an illegal connection elimination program, a critical source monitoring program, and a receiving waters impact study. The mass emissions monitoring element samples runoff from a total of 1500 square miles of drainage area. The Los Angeles River drainage area is the largest. The land use monitoring element samples runoff from eight significant land use categories that represent over 80% of the total land use in Los Angeles County. The list of chemical constituents sampled includes metals, hydrocarbons, pesticides, solids, nutrients, semi-volatile organics, and selected minerals.

The information collected from the monitoring program is being used to: track water quality status, trends, and loads and identify pollutants of concern; monitor and assess land use and watershed pollutant loads; identify and assess significant water quality problems in watersheds; identify sources of pollutants in runoff; identify and eliminate illicit connections and discharges; evaluate the effectiveness of best management practices, and; assess impacts on receiving waters.

76 SOME SOURCES OF BACTERIAL INPUTS INTO THE LOS ANGELES RIVER FROM DOWNTOWN LOS ANGELES, CALIFORNIA

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Studies in 1997 and 1999 in downtown Los Angeles revealed several major sources of bacterial contamination of runoff draining to the Los Angeles River. Sources included runoff from alleys washed daily by the City, businesses that distribute food products, and human fecal matter deposited on the streets and in alleys that eventually is washed into the storm drains.

Alley-washing runoff was contaminated mainly by human feces; densities of total and fecal coliforms (cfu/100 ml) averaged about 152.5 and 2.3 million respectively with maximum densities of 1.1 billion for total, and 10 million for fecal coliforms. The food-distribution facilities, distributed mainly in the 8<sup>th</sup> St. drainage area, generated daily runoff contaminated with food wastes. Throughout the 8<sup>th</sup> St. storm drain system, densities of total and fecal coliforms were similar to those measured in the alleys: total and fecal coliforms averaged about 125, and 41 million, respectively, with peak densities of 2.4 and 1.3 billion. Runoff from City alley and street washing operations is now collected and deposited into the sanitary sewer, however, during the wet season, contaminated runoff from the alleys would still run to the River. City inspectors are now working with the food distribution businesses to control runoff from their facilities into adjacent storm drains.

77 AT THE RIVER'S END: PERSPECTIVES FROM THE CITY OF LONG BEACH.

R. Collins, Clean Water Program, City of Long Beach

Abstract not available

78 IMPACTS OF THE LOS ANGELES AND SAN GABRIEL RIVERS ON THE COASTAL OCEAN - OBSERVATIONS FROM A LA NIÑA YEAR 1998-99

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The Los Angeles and San Gabriel Rivers are the largest drainage systems in Los Angeles. During most of the year the flow in both systems is relatively low, but during winter rain events, significant runoff results in large flows from both rivers entering the coastal ocean through the ports of Los Angeles and Long Beach. Results are compared from October prior to the onset of winter rains, and from a rain event in January 1999. During wet weather study we observed significant freshwater plumes from the Los Angeles and San Gabriel Rivers. The presence of runoff plumes was immediately evident in salinity and turbidity (beam attenuation). Because this was a relatively dry year, and the rain event was not large, the influence of the plumes extended only a limited distance offshore and only a few meters down into the water column from the surface. The data presented shows that the plumes are advected alongshore from the source due to coastal currents, expanding the area of impact beyond the mouths of the rivers. Evidence from other studies in the region indicate that after the particulate material from the runoff has settled from the system, the fresher nearsurface runoff plume remains high in particulate material due to the blooming of phytoplankton in the surface ocean affected by the stormwater runoff. It is clear from this study that major outflows during a moderate rain event are primarily associated more with urban runoff systems where there is more surface hardening within the watershed.

79 CITIZEN WATER QUALITY MONITORING IN THE LOS ANGELES RIVER WATERSHED

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Citizen monitoring is defined as environmental monitoring performed by members of the community interested in watershed protection. A great deal of citizen monitoring is done on a volunteer basis, and is therefore often referred to as Volunteer Monitoring. Citizen monitors may be educators, students, members of environmental groups, or interested citizens. Volunteers either conduct their own testing regime, or they may assist professional scientists with sample and data collection, and data entry. In the Los Angeles area citizen monitoring is coordinated through the Los Angeles Volunteer Monitoring Steering Committee, composed of agency representatives, environmental groups, and scientists. The State Water Resources Control Board's Citizen Monitoring Program participates on this committee and supports its efforts by providing training, technical assistance, and quality assurance services.

Members of the Steering Committee perform a quarterly water quality "snapshot" effort. Quality assurance measures include instrument calibration, titration reagent checks, split samples, reagent blanks, spiked standards, and lab replicates. One geographic area included in this snapshot is the Los Angeles River watershed, which is monitored by the Southern California Marine Institute, working with volunteers from the Surfrider Foundation, Algalita Marine Research Foundation, Long Beach Yacht Club, Granada Hills High School and Jordan High School. Parameters include dissolved solids, temperature, pH, dissolved O<sub>2</sub>, nutrients, sensory observations, coliform and enterococcus bacteria, and estuarine light penetration, color, and phytoplankton. Results indicate a polluted system resulting in eutrophic conditions contributing to algal blooms in the estuary.

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#### 80 OCCURENCE OF *Heterosigma akashiwo* IN SAN PEDRO BAY

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*Heterosigma akashiwo* is a raphidophyte known to produce red tides that can result in fish mortality. During the spring of 1998 a red tide prevailed in San Pedro Bay, within the Los Angeles and Long Beach Harbors complex, centered at the mouth of the Los Angeles River. Based on light microscopy of living cells, this red tide organism was isolated and tentatively identified as being *H. akashiwo*. This algae had never been documented previously in San Pedro Bay. To provide confirmation that *H. akashiwo* had become established in San Pedro Bay, the isolate identity was determined by sequencing of the nuclear ribosomal internal transcribed spacer (ITS) region. Species determination was made by direct comparison to previously identified *H. akashiwo* ITS sequence (isolate NIES 6; GenBank accession number AF157381). The result of this work was that there was complete sequence identity between the San Pedro Bay isolate and *H. akashiwo* isolate NIES 6. This is the first documentation of *H. akashiwo* in Californian waters, USA.

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#### 81 FOLAR RIVERWATCH: ADDRESSING WATERSHED ISSUES IN THE NEW MILLENNIUM

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Biological monitoring may prove to be as necessary as physical and water quality monitoring in understanding the impact of non-point source pollution on the health of the Los Angeles River and its watershed. FoLAR's volunteer will collect data over a twelve-month period beginning in August 2000 for the purpose of: Producing a comprehensive inventory of the river's habitat and biota Investigating and defining the usefulness of an Index of Biological Integrity (IBI) for the Los Angeles River Providing reports detailing seasonal variations in habitat and biota Making recommendations for restoration and conservation projects compatible with the current state of the river's health Evaluating the role of phytoremediation as a restoration and conservation tool Mapping locations of exotic species for removal.

Without the assistance of educational institutions and volunteers with scientific backgrounds, it will be impossible for agencies to collect and analyze enough information to address watershed issues in the new millennium. Without public participation, there will no political support for funding the studies necessary for understanding the fate and transport of pollutants and debris traveling down the Los Angeles River to San Pedro harbor.

#### 82 KEYNOTE PRESENTATION ABOUT WATERSHED MANAGEMENT IN THE LOS ANGELES AND SAN GABRIEL RIVERS WATERSHED AND THE COUNCIL'S NEW PUBLICATION: "STORM WATER: ASSET NOT LIABILITY"

Dorothy Green, President, Los Angeles & San Gabriel Rivers Watershed Council, Los Angeles, CA 90012

The Council was formed three years ago to develop better communication between and among the various agencies with responsibilities in the watershed and with the public, and to develop the necessary partnerships to preserve, restore and enhance the watershed. Its first major publication explores the relationship between urbanization and rainfall, its impacts on natural systems, and existing and alternative ways of managing storm water. The book emphasizes reducing the volume and velocity of storm water through structural and non-structural approaches, and encourages the development of multi-purpose projects so that multiple sources of funding can be tapped. It contains examples of existing laws and regulations as well as projects already in the ground that furthers these goals. And concludes with an outline of a Watershed Management Plan, and the data gaps that need to be filled.

### 83 DETERMINANTS OF PLANT COMMUNITY STRUCTURE IN SOUTHERN CALIFORNIA RIPARIAN HABITATS

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Southern California's summer drought and highly variable winter rainfall regime present a complex combination of disturbance, drought, and flooding for plants occurring in riparian habitats. These factors vary along the length of a watercourse as the width of the active channel changes in response to substrate composition, channel bar formation, and drainage topography. The result, in an unchanneled river, is a complex array of dynamic habitats which form a continuum between narrow, high stream energy channels which experience increased disturbance intensities but have higher summer water availability, and wide, low stream energy channels which experience decreased disturbance intensities but increased potential for summer drought. The Los Angeles River mixes characteristics of both wide channels and narrow channels as a result of the constraints of the concrete walls. During storm events, the concrete walls function as a narrow channel concentrating high stream energy; at other times, the low flows in the soft bottom portion of the channel together with the channel bars formed from debris, create a structure more characteristic of wide channels. However, summer water availability mimics that of narrow channels because of year round flow resulting from water treatment facilities upstream, and urban run-off. The purpose of this paper is to explore the influence of these determinants on plant species composition in unchanneled rivers in order to explain existing species composition in the Los Angeles River and to create a conceptual model describing potential species composition scenarios under different revegetation/restoration scenarios along the Los Angeles River

### 84 BREEDING BIRD SPECIES AS INDICATORS OF RIPARIAN ECOSYSTEM HEALTH IN URBAN LOS ANGELES: A LOCAL AND REGIONAL PERSPECTIVE

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With a few exceptions, most existing riparian vegetation on the floor of the Los Angeles Basin is confined to soft-bottomed sections of storm drains and in flood-control basins. Here, the riparian vegetation may closely mimic the historical "willow sloughs" that once dotted the basin, and, with proper management, may support a large subset of the region's historical riparian bird community. Because riparian bird species differ strikingly in their sensitivity to habitat loss and modification, they are ideal organisms to monitor for restoration projects. Successful riparian restoration should operate on two scales, local and regional. At the local level, managers should focus on attracting the most sensitive breeding bird species, which are summarized here. However recognizing that each individual project cannot support a full suite of riparian birds, all restoration efforts in the Los Angeles area should be coordinated to achieve a high regional species representation reflective of the full range of riparian habitats and species.

### 85 FRESHWATER FISHES OF THE LOS ANGELES RIVER, SOUTHERN CALIFORNIA

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Seven or eight species of inland freshwater fishes historically inhabited the Los Angeles River and the so-called Los Angeles basin streams to the east, the Santa Ana and San Gabriel Rivers. Three or four additional marine and/or estuarine species undoubtedly invaded the lower river, using it as a nursery, but were not recorded in the river proper before it was so modified as to become unsuitable for them. Currently, only three species (the south coast minnow-sucker community) remain in the Los Angeles River system, and are found only in Big Tujunga Creek from Big Tujunga Dam downstream to upper Hansen Dam. These include the Santa Ana sucker (*Catostomus santaanae*) (proposed Federal Threatened), Santa Ana speckled dace (*Rhinichthys osculus* ssp. nov.) and arroyo chub (*Gila orcutti*) (both State Species of Special Concern). They thrive in the moderate to fast cool or cold flows in gravelly and rocky riffles (suckers and dace), alternating with slower pools (chubs). Spring-fed Haines Creek provides high quality habitat downstream of the 210 freeway; further upstream the habitat is compromised by irregular flows from Big Tujunga reservoir. Dace have only been found in the lower area in the last several years. This critical remnant area needs increased protection, the available habitat enlarged, and control/elimination of exotic aquatic predators and competitors to allow this native fish community to persist and thrive.

## 86 HYDROLOGIC CONSTRAINTS ON URBAN RIVER RESTORATION

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Urban river restoration is usually done in the context of maintaining pre-restoration levels of flood protection. This is particularly true for urban rivers passing through heavily developed areas. Restoration projects need to consider all options for obtaining flood control, including upstream storage, downstream channel capacity, and changes in system-wide operation procedures. Development of these options may be constrained by the hydrology of the river system in various ways such as the need to empty storage reservoirs before the next storm, significant increases in required channel cross-section after concrete removal, and avoidance of risk shifting. Consideration of alternatives for the LA-San Gabriel River LACDA project involved all of these issues and provides a useful case study of how hydrology can constrain urban river restoration.

## 87 REGIONAL RESORATION GOALS FOR WETLAND RESOURCES IN THE GREATER LOS ANGELES DRAINAGE AREA

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In order to achieve the greatest ecological return and a program of regionally sustainable restoration, a watershed level, function-based approach to the identification and implementation of wetland restoration goals is needed in the Metropolitan Los Angeles area.

Using a landscape-scale GIS model of recent historic (circa 1870) and current wetland resources in conjunction with a hydrogeomorphic classification method, a set of fifteen interrelated restoration goals was developed that seeks the long-term recovery of viable habitats and the full range of ecosystem services once provided by the region's wetlands.

## 88 WETLANDS OF THE LOS ANGELES RIVER WATERSHED: PROFILES AND RESTORATION OPPORTUNITIES.

Sean Woods and Chris Kroll, California Coastal Conservancy, 1330 Broadway, Oakland, CA 94612

The Coastal Conservancy is currently involved in the evaluation of restoration sites in the Los Angeles River watershed. A survey of potential environmental restoration projects in the Los Angeles River Watershed was conducted titled, Wetlands of the Los Angeles River Watershed: Profiles and Restoration Opportunities. The purpose of this report was to provide information on the wetland resources within the watershed, to examine possible restoration opportunities, and to develop a regional framework within which such opportunities can be considered. As part of this ongoing effort within the Los Angeles River Watershed the Coastal Conservancy has funded a grant to the City of Long Beach to conduct a feasibility study for restoration of two wetland sites identified in the report: the DeForest Park Expansion and the 6th Street Site adjacent to the western levee of the Lower Los Angeles River.

## 89 ARROYO SECO RESTORATION PROJECT

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Restoration of riparian habitat along an approximately one-mile reach of the Arroyo Seco through the City of Pasadena was undertaken as a cooperative effort between the City of Pasadena and Browning-Ferris Industries of California, Inc. The project was required as mitigation for riparian wetland impacts resulting from extension of the Sunshine Canyon Landfill in Los Angeles County. Several federal, state and local agencies with jurisdiction over the project needed to approve a mitigation/restoration plan and detailed engineering drawings before restoration could begin.

The restoration plan called for over four acres of riparian wetlands to be created on former floodplain terraces adjacent to a channelized reach of the arroyo. Water would be diverted into created stream channels on the terraces by gravity flow from an existing retention basin upstream. Native plant materials were to be propagated from local sources and planted out over an approximately 20-acre area around the streamzones. Establishment irrigation for plants outside of the immediate streamzone would be provided by an on-site well.

Construction began in spring of 1996 and site grading was completed in January 1997. The water diversion facilities were completed in spring of 1997 and plantings were installed. A five-year compliance monitoring program to evaluate extent of riparian wetland habitat, percent survival, percent cover, growth rates and other factors began in 1998. The created stream channels and water diversion system are providing the desired results and riparian wetland habitat is becoming well-established.

90 WATERSHED PLANNING AT THE URBAN/WILDLAND INTERFACE: A CASE STUDY OF THE ARROYO SECO.

T. Brick

No abstract

91 COMPARATIVE MORPHOLOGY AND HISTOLOGY OF THE DIGESTIVE TRACT OF THE TELEOST FAMILY *THRICHOMYCTERIDAE*: THE PARASITIC CATFISHES

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Trichomycteridae are neotropical catfishes best known as parasites. Species of two subfamilies, which are sister taxa, are parasitic on other teleost fishes: Vandelliinae feed on blood and the Stegophilinae feed on scales, mucus or flesh. They have a tubular, straight digestive tract and a distinct stomach is lacking on a gross morphological level. The Trichomycterinae, which are generalized feeders on macroinvertebrates, have a tubular digestive tract with one loop in the anterior section and appear to lack a stomach also, as does the Tridentinae. *Nematogenys*, a basal trichomycterid, and several other catfishes examined, have a normal appearing stomach. Histological preparations were made of the digestive tract of several genera of trichomycterids, other siluriforms and ostariophysans, including stomachless species. Digestive tract specializations such as the possible lack of gastric tissue were determined, and functional and evolutionary trends among trichomycterids and other teleosts were considered. The results show gastric tissues in the anterior portion of the digestive tract of Trichomycterinae but not in the Vandelliinae or Stegophilinae. Field examination of gut pH confirms the lack of acid secretion in the latter and an acidic environment in Trichomycterinae. The intestinal tissues of all the trichomycterids are weakly developed compared to the same tissues in other fishes. A preliminary conclusion is that Trichomycterinae have a reduced stomach and possibly all the other trichomycterids have lost the stomach except *Nematogenys*. These results support previous phylogenetic studies of this family.

92 PHYLOGEOGRAPHIC RELATIONSHIPS OF THE SANDBASSES OF THE GENUS *PARALABRAX* (SERRANIDAE, PERCIFORMES).

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An historical biogeography of *Paralabrax*, based on a phylogeny obtained from morphological and molecular data and sequence divergence data of cytochrome-b gene, is discussed. *Paralabrax* has 2 clades, one with 3 species from the California Region, *auroguttatus* and the sister *maculatofasciatus-nebulifer*; the other contains the remaining 6 species and includes *loro* (Mazatlan-Panama), *dewegeri* (W Atlantic) and 2 pairs of sister species, *callaensis-albomaculatus* (Peru-Ecuador and Galápagos, respectively) and *humeralis-clathratus* (Perú-Chile and California, respectively). The divergence data suggest a late Miocene evolution for the species of *Paralabrax*. A plausible phylogeographic scenario involves the separation of the ancestor of *Paralabrax*, from its sister *Centropristis* (W Atlantic), in the NE tropical Pacific. This ancestor gave rise to a Californian and a Mexican species, separated at the tropical-temperate boundary. The Californian ancestor gave rise to 3 species during vicariant events associated with the formation of the Gulf of California. The Mexican ancestor separated into a northern hemisphere species (*loro*) and another species that dispersed to South America and separated into an Atlantic (*dewegeri*) and a Pacific form; the latter gave rise to two pairs of sister species, *albomaculatus-callaensis* and *clathratus-humeralis*. The evolution of both clades probably took place at the same time.

93 LACTATE CONCENTRATIONS IN WHITE, RED AND HEART MUSCLE IN TERRESTRIAL CALIFORNIA GRUNION (*Leuresthes tenuis*).

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During spawning, the California grunion (*Leuresthes tenuis*) removes itself completely from water to deposit eggs on sandy beaches in southern California. Grunion were captured and held in the laboratory for several days in a marine aquarium, then were removed from water and allowed to remain out for 0, 5, 10, 15 or 20 minutes before being exercised. Then, the fish were forced to exercise by prodding until they were unable to right themselves. Lactate and glucose concentrations were measured in white muscle, red muscle and the heart of this marine fish. For lactate concentration, significant differences over the time out of water were found only in the white muscle. For both

white and red muscle, glucose concentration changed significantly over time. As the duration of activity increased, lactate concentrations in the white muscle increased, regardless of how long the fish had previously been out of the water. This study supports the hypothesis that anaerobic metabolism, as indicated by lactate formation, is correlated with activity while terrestrial, rather than simply with being emerged from water.

94 USE OF A SYNTHETIC POLYPEPTIDE TO DETERMINE THE SEX AND REPRODUCTIVE STATUS OF FIELD-CAUGHT RED GROUPER, *EPINEPHELUS MORIO*

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To possibly exploit the relationship established in the literature between plasma estradiol levels, serum vitellogenin (vt), and gender, this study examined the gonadal histology changes preceding, and immediately following, the spawning season of red grouper, *Epinephelus morio*, in relation to variations in vt determined by immunogenetic probing. Synthetic peptides were constructed from conserved fish vt sequences and antibodies to them were raised in rabbits. Blood and gonad specimens of red grouper and gag were collected on recreational and research vessels between February and August of 1998. A sample of 95 red grouper was obtained, including 75 histological females, 19 males, and 1 transitional fish. All gag were females. Western blots of collected plasma showed all gag to be virtually identical in vt content. Among red grouper, two protein bands (~ 187 kD and 270 kD) appeared to react most intensely with the synthetic probe. The 187 kD band was stimulated in estradiol-treated red grouper, with definite higher levels produced in test versus control fish. However, no significant differences were detected in vt levels among developmental stages with respect to the 187 kD band in wild-caught fish, nor between histological males and females. The 270 kD band showed a significant peak in early/mid ripening females. Oocytes occurred in mature male red grouper indicating a lack of hormonal "control" in these sex-reversed fish. This evident lack of hormonal control in protogynous grouper could explain vitellogenin levels comparable to those found in female fish, indicating that vitellogenin is not a female specific protein.

95 EXAMINING THE RELATIONSHIP BETWEEN PUBLIC PERCEPTIONS AND ENVIRONMENTAL QUALITY: A SURVEY STUDY OF BEACH USE AND PERCEPTIONS IN LOS ANGELES COUNTY

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Despite documented successes in the battle to clean up the coastal waters of Southern California, Los Angeles County residents continue to view the ocean more as a reservoir for pollution than a vibrant and natural place for bathing and swimming. This study shows that residents of Los Angeles County tend to hold perceptions of marine water quality that are at odds with data on bacteriological measures of water quality collected by local sanitation districts (and reported by Heal the Bay.) Summary results of a survey of 400 randomly chosen households in Los Angeles County are given. Respondents were asked about their beach use and perceptions of environmental quality: both coastal water quality and air quality. The results show that perceptions of coastal water quality may be influenced less by "current coastal education campaigns" and more by the media and other factors.

96 COMPOSITION AND DISTRIBUTION OF BEACH DEBRIS IN ORANGE COUNTY, CALIFORNIA.

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Many studies have quantified the amount of debris on beaches, but studies conducted in the United States have been limited to semi-quantitative efforts conducted as part of volunteer clean-up activities. Here we quantified the distribution and types of beach debris on the Orange County, California coastline by sampling 43 stratified random sites in August/September 1998. A 25 yard width of beach from the waters edge to the first pavement or rocky cliff was delineated at each site and all trash was cleaned by at least three people walking systematic transects. In addition, a five-gallon bucket of sand was sieved at each site to quantify the small items that were undetected by initial examination. More than 46 million items, weighing about 60 tons, were estimated to occur on Orange County beaches. The most abundant items were pre-production plastic pellets, followed by foamed plastics and hard plastics. Debris density on remote rocky shoreline was more than double that on high-use sand beaches, partially reflecting the periodic cleanup of high use beaches by local municipalities, but also indicating that a high percentage of the observed debris



was from water borne sources. Our debris estimate was 70 times that collected during the California Coastal Commission's Coastal Cleanup Day, which appears attributable to the focus of their volunteers on large debris at a subset of high use beaches.

97 EFFICIENCY AND ACCURACY OF STORMWATER MASS EMISSION MONITORING PROGRAMS IN SOUTHERN CALIFORNIA.

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Stormwater runoff is currently perceived as a large source of pollutants to the coastal oceans of southern California. Assessments of the magnitude of stormwater mass emissions are hampered, however, because monitoring of these discharges has only recently begun and the effectiveness of current sampling strategies is unknown. The objective of this study was to comprehensively measure runoff from an urbanized southern California watershed to assess precise pollutant mass emissions. The goal was to provide a census of runoff water quality to assess pollutant variability within and among storm events, calculate runoff mass emissions, and then compare mass emissions from urban runoff to other sources of pollutants. Nearly 2,000 samples taken at 15 min intervals during the 1997/98 wet season were collected from the Santa Ana River, an urbanized watershed in Orange County, CA. All samples were analyzed for total suspended solids (TSS); a selected subset was analyzed for total organic carbon (TOC), total nitrogen (TN), and trace metals (cadmium, chromium, copper, lead, nickel, and zinc). The results were utilized to calculate the "true load" and evaluated for first flush effects, seasonal flushing, and the relative contributions resulting from changes in rainfall intensity, flow, different sub-watersheds and upstream dam releases. The bias introduced by the different sampling designs employed by each of the municipal permittees was assessed by recalculating the loads based upon their techniques. Finally, Monte Carlo statistical routines were used to assess the most efficient sampling design to calculate loads with specific levels of confidence and power to detect trends.

98 USING THE SEDIMENT QUALITY TRIAD APPROACH IN SEDIMENT QUALITY MONITORING NEAR A SOUTHERN CALIFORNIA MUNICIPAL WASTEWATER OUTFALL.

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The Sediment Quality Triad (SQT) approach to sediment quality assessment incorporates sediment chemistry analysis, biological analysis, and sediment toxicity testing into a single assessment for each sampling location. This approach allows sediment quality to be assessed on a weight of evidence approach as opposed to numerical limits. The Orange County Sanitation District (District) operates the third largest municipal POTW west of the Mississippi River treating an average of 255 million gallons per day of wastewater, which is released into the ocean 8 km offshore at a nominal depth of 60 m. Per the NPDES 301(h) ocean discharge permit, the District conducts a comprehensive core ocean monitoring program that includes quarterly sediment geochemistry and benthic infaunal analyses at 10 stations along the 60 m isobath on the San Pedro Shelf. In addition to core monitoring assessments, the District is conducting a three-year study, adding a sediment toxicity component, to evaluate sediment quality using the SQT approach. Results from the first year of testing show little impact to sediment chemistry contaminant levels and the balanced indigenous infaunal community. Sediment toxicity varies with test species, but exhibits little to no correlation with sediment chemistry results. This lack of correlation with sediment chemistry and the overall good health of the infaunal community indicate that contaminants or conditions causing toxicity in laboratory tests are not readily bioavailable or toxic in situ and good sediment quality conditions exist within the study area.

99 NITRATE CONTAMINATION OF SURFACE WATER AND SHALLOW GROUNDWATER IN THE IRVINE SUBBASIN, ORANGE COUNTY, CALIFORNIA

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Nitrate concentrations were measured in shallow groundwater and surface water in the Irvine Subbasin, Orange County, California. From April 1999 until January 2000, we collected and analyzed surface water and groundwater for nitrate and index parameters (specific conductance, Eh, pH, dissolved oxygen, and temperature). Over 900 samples were collected at 82 sampling stations in creeks, drainages, and shallow water wells. Nitrate concentrations were highest in drainage ditches that collect surface runoff from large commercial nurseries in the upper part of the watershed. Nitrate concentrations in these drainage ditches usually exceeded 200 mg/L, and sometimes were as high as 700 mg/L. Nitrate concentrations in drainage ditches that collect runoff from modern and technologically advanced agricultural lands were usually less than 20 mg/L. However, samples collected from the shallow aquifer in

the upper to middle portions of the watershed varied from 50 mg/L to as much as 250 mg/L nitrate, reflecting the historical effects of leaching from older agricultural plots that have been displaced by urban development. Urban runoff was usually less than 15 mg/L nitrate. Water tables in much of the watershed are higher than the elevation of local streams, resulting in gaining stream conditions from groundwater seepage. These streams eventually discharge into upper Newport Bay, a thriving ecological habitat. Nitrate in discharge waters contributes to algal growth in the bay, which has an adverse impact on the bay's ecology.

100 ENERGY ALLOCATION AND POSTNATAL GROWTH IN FISH-EATING SEABIRDS: FEEDING TRIALS WITH CAPTIVE ELEGANT TERN CHICKS RAISED ON HIGH VS. LOW ENERGY DIETS

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

The interval between hatching and fledging may require more energy than at any other time in a bird's life. This period of rapid growth and development may be particularly critical for piscivorous seabirds because they consume fish species that vary in energy content. This variation in food quality, coupled with current changes in ocean conditions that affect the abundance of their preferred high-energy prey, means that seabirds are increasingly likely to provision their chicks on alternative, lower quality prey. A seabird species faced with such challenges is the Elegant Tern, whose diet at the Bolsa Chica Ecological Reserve in southern California consists of >60% energy-rich clupeoids, fishes that have fluctuated in abundance both historically and recently. To investigate the effects of diet quality on chick growth and development, we raised Elegant Tern chicks in the laboratory on three diets: (1) energy-rich northern anchovy, a clupeoid, at the average daily intake rate, (2) energy-poor topsmelt at the average daily intake rate, and (3) topsmelt at an amount equal in energy to the anchovy diet. As expected, chicks raised on equal-energy diets of anchovy and topsmelt had higher rates of mass gain than chicks raised on the low-energy diet of topsmelt. Despite differences in energy intake, all three groups had similar wing growth, indicating that chicks preferentially allocate energy toward structural growth. Analysis of body composition is underway to determine whether the differences in mass gain resulted from the allocation of energy toward muscle or toward fat.

101 TROPHIC POSITION OF SOUTHERN CALIFORNIA ESTUARINE AND ISLAND POPULATIONS OF THE SILVERSIDE FISH *Atherinops affinis* (TELEOSTEI: ATHERINOPSIDAE): ANALYSES OF 15N AND 13C STABLE ISOTOPES AND DIETARY ITEMS.

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The silverside fish *Atherinops affinis* (Teleostei: Atherinopsidae) is an abundant fish species of the eastern north Pacific and an important component of coastal and estuarine food webs. The feeding strategy of *A. affinis* appears to be one of an opportunistic herbivore; prior dietary studies have noted differences in diet based principally on habitat but also on season and fish age. We sought to clarify exact role of *A. affinis* in the southern California marine food web during one summer by comparing the trophic position of estuarine and island populations through analyses of stable isotopes (15N and 13C) and dietary items. Dietary analysis has traditionally been used to determine an animal's trophic level but has limitations due to differential digestibility of food items. We combined traditional dietary analysis with stable isotope analysis to obtain a more complete picture of *A. affinis* feeding. 15N indicates trophic position, and 13C can be traced to dietary origins. By examining these stable isotopes in both muscle and liver tissues, which have different turnover rates, we were able to gain a temporal insight into feeding by first-year topsmelt during one summer season. During summer months, *A. affinis* comprise a large portion of various sea bird diets, and, therefore, play an important role in the flow of energy, nutrients, and contaminants through marine communities.

102 MICROSATELLITE DIVERSITY IN THE MESOPELAGIC SHRIMP *ACANTHEPHYRA CURTIROSTRIS* (CARIDEA: OPHOPHORIDAE).

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The shrimp family Ophophoridae is composed of mostly strongly swimming, oceanic, holoplanktonic species. The family is cosmopolitan in distribution and usually deep living, with many species engaging in nocturnal migration towards the surface. The geographical range for many oplophorid species is very large, in some cases including nearly all oceans. No information on genetic variation or population genetic structure within these widespread species is known. *A. curtirostris*, a member of the largest oplophorid genus, is a midwater species with a widespread distribution being found at lower latitudes around the world and to nearly 51 degrees north in the eastern Pacific. Our current tissue collection of *A. curtirostris* contains specimens from locations off Southern California and Hawaii. We have

developed microsatellite markers for *A. curtirostris* which are being used for the study of genetic structure within this species. Microsatellite repeats in *A. curtirostris* appear to be common. Many of the repeats are composite in nature consisting of adjacent runs of dinucleotide, trinucleotide and tetranucleotide repeat units. Dinucleotide arrays with extremely long repeat lengths (100 plus repeat units) were found. GT/AC repeats were common and generally comprised the longest dinucleotide repeats.

#### 103 BIODIVERSITY AND DISTRIBUTION OF PERACARID CRUSTACEAN ASSEMBLAGES OFF SAN DIEGO, SOUTHERN CALIFORNIA

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The continental shelf of the Southern California Bight (SCB) is a complex environment subjected to a wide range of oceanographic and anthropogenic influences. Crustaceans comprise an important component of soft-bottom communities in such areas, with peracarids often dominating these assemblages. The peracarid fauna of the shelf between 10 and 200 m in depth and spanning ~630 km<sup>2</sup> was investigated in the San Diego region of the SCB from 1994 through 1997. A total of 143 quantitative 0.1 m<sup>2</sup> grabs captured 6,277 peracarid crustaceans, representing 180 species. These species account for about 49% of the known peracarids in the region and belong to 111 genera and 46 families of Amphipoda, Cumacea, Isopoda, Tanaidacea and Mysidacea. Approximately 11% of the taxa could not be identified to known species. Amphipods represented the most diverse taxa, accounting for 66% of the species. Cumaceans accounted for 15% of the species, isopods for 9%, tanaids for 6% and mysids for 4%. Amphipods were also the most abundant, accounting for about 77% of all peracarids. Cumaceans accounted for 7% of the individuals, isopods for 5%, tanaids for 10% and mysids for 1%. Classification and ordination of sites discriminated between seven habitat-related assemblages occurring in shallow (10-32 m), mid-depth (32-115 m), and deep (115-200 m) waters, and in fine vs. coarse sediments. The numerically dominant species characterizing these assemblages included the amphipods *Heterophoxus ellisi* (deep), *Heterophoxus oculatus* (mid), *Photis brevipes* (mid) and *Ampelisca cristata cristata* (shallow), the cumacean *Hemilamprops californicus* (shallow), and the tanaid *Leptochelia dubia* (mid-deep).

#### 104 TEMPERATURE EFFECTS ON THE FEEDING ECOLOGY OF THREE SEAWEED-EATING SPECIES OF *TEGULA* (TROCHIDAE: GASTROPODA) FROM CENTRAL AND SOUTHERN CALIFORNIA

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Changes in sea temperature are known to determine the distributional limits of coastal populations of marine invertebrates. However, the mechanisms by which temperature determines these distributions are poorly understood. Two possible mechanisms, food consumption and nutrient uptake, are essential to growth and reproduction, although little is known about temperature effects on the feeding ecology of most coastal invertebrates. Trochid snails are ideal candidates for such studies because several closely-related species have distributions limited to regions either north or south of Point Conception, California. Populations from three closely-related *Tegula* species were used to determine the effects of temperature on consumption rates and gut passage times: one cold-water species (*T. brunnea*), one warm-water species (*T. aureotincta*), and warm and cold-water populations of a cosmopolitan species (*T. funebris*). We hypothesized that: 1) *T. aureotincta* would experience reduced consumption rates and gut passage times at colder temperatures; 2) *T. brunnea* would experience similar reduced consumption rates but at warmer temperatures; and 3) *T. funebris* would exhibit reduced temperature effects. Snails were fed kelp while maintained at 11, 15, 19, and 23°C. Consumption rates for the two warm-water populations and *T. brunnea* were significantly greater at warmer temperatures, whereas the rates for the cold-water population of *T. funebris* were significantly greater at colder temperatures. No significant differences were found in the gut passage time for any population. This study suggests that rising sea surface temperatures may alter trochid distributions by affecting rates of food consumption and reducing nutrient acquisition.

#### 105 LICHENS OF THE CALIFORNIA CHANNEL ISLANDS

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The lichen flora of the California Channel Islands have been the subject of studies since the turn of the century. Most of the studies of the Channel Islands lichen flora have occurred in the last twenty years, several of these studies have been conducted by the author. Some coastal California lichens formerly collected from the mainland are now

found only on the Channel Islands. Unlike vascular plants on the islands, very few lichens are endemic to the islands. This paper summarizes what is known to date, and discusses distributions, rarities, and commonalties of the known lichen flora of the islands

#### 106 CONSERVATION OF CALIFORNIA LICHENS

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Little attention has been given to the group of organisms referred to as lichens by land use and resource agencies in California, or other states as well. No species of lichen has been listed as threatened or endangered in California by either the California Fish and Game Commission or the U.S. Fish and Wildlife Service even though several species of lichen qualify for such listing. Very few lead agencies require evaluation of environmental impacts projects may have on the lichen flora when conducting environmental reviews pursuant to the California Environmental Quality Act (CEQA), even though all biological resources, including lichens, should be evaluated. The California Lichen Society (CALS) has taken a first step to raise the level of consideration for project-related impacts to lichens by publishing the author's Preliminary List of Rare California Lichens in its Bulletin of the California Lichen Society 6(2). The California Native Plant Society (CNPS) has also been raising concerns about the lack of consideration for impacts to the California lichen flora in CEQA documents. CNPS even filed a lawsuit against Ventura County in 1997 over this and other issues, and prevailed. CALS and CNPS have developed specific strategies, based on current environmental law and scientific principles, to increase the level of consideration the lichen flora, and especially rare lichen species, for all project impact assessments in California.

#### 107 VARIATIONS IN THALLUS MORPHOLOGY, CHEMISTRY, EXCIPLE ANATOMY AND SPORE ULTRASTRUCTURE OF THE SAXICOLOUS LICHENS TREATED WITHIN THE *Buellia retrovertens* - GROUP

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Saxicolous lichens of the *Buellia retrovertens* - complex have been studied as part of a taxonomic revision of saxicolous *Buellia* species with one-septate spores from the Sonoran Desert region. Specimens from the Sonoran Desert have been examined with conventional light microscopy, thin layer chromatography (TLC), transmission electron microscopy (TEM), and scanning electron microscopy (SEM). The specimens show a remarkable variation in thallus morphology. However, thallus chemistry, exciple anatomy, and spore ultrastructure are rather consistent. This supports Imshaug's (1951) thesis to treat the various morphotypes within the single species *Buellia retrovertens* Tuck. There is evidence, however, that the group is closely related to the European *Buellia dispersa* A. Massal. and, if synonymized, this latter name will have priority. Finally the status of *Buellia subalbula* Müll. Arg. is discussed briefly. This species has frequently been misidentified as *B. retrovertens*. Although it has only one-septate spores, *Buellia subalbula* is more closely related to species with pluriseptate spores like *Buellia venusta* (Körb.) Lettau.

#### 108 CALLEGUAS CREEK WATERSHED WETLANDS RESTORATION PLANNING

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Wetlands within the Calleguas Creek watershed, which includes the southeastern portion of Ventura County, including Simi Valley, Las Posas Valley, Santa Rosa Valley, Conejo Valley, and the eastern portion of the Oxnard Plain, have been severely impacted and degraded by development over the last 200 years. Less than 10 percent of historic wetlands remain in the watershed, and the functions of the remaining wetlands have been severely degraded. David Magney Environmental Consulting (DMEC) recently completed an intensive and watershed-wide study of existing wetlands within the Calleguas Creek Watershed, and developed wetland restoration plans for twelve sites within the watershed. DMEC is conducting this work for the California State Coastal Conservancy on behalf of the Calleguas Creek Watershed Habitat and Recreation Subcommittee through a grant issued to the Conservancy by the U.S. EPA. All data gathered for this effort have been input into a robust GIS database, using Arc/Info and ArcView software. Watershed wetland conditions were assessed at approximately 50 reference sites, using the U.S. Army Corps of Engineers Hydrogeomorphic Assessment method (HGM). The HGM method models are designed to capture the range of wetland functions based on the general wetland type. The majority of wetland reference sites in the

Calleguas Creek watershed are riverine (palustrine) wetland types. The data gathered at the reference sites will be used as part of a regional HGM wetland model to be developed in the future. One or more of the candidate wetland restoration sites will be implemented within the next year.

P1 EVIDENCE OF THE 1997-1998 EL NIÑO IN A LOCAL OCEAN MONITORING PROGRAM.

D. O'Donohue, A. Groce. City of San Diego, Ocean Monitoring Program, San Diego, CA 92106.

The City of San Diego has monitored the San Diego coastal marine environment since 1962, as part of a National Pollutant Discharge Elimination System (NPDES) permit. Data are collected for a number of physical and biological parameters; physical parameters include routine water quality measurements such as temperature, salinity and transmissivity. These data provide strong evidence of the large scale ENSO event of 1997-1998. For example, a large influx of water with elevated temperatures was found in the sampling area, starting in August 1997. This dramatic increase in water temperature is clearly depicted in a time series of three-dimensional plots of CTD vertical profile data utilizing GIS (Geographical Information System) technology, as well as more traditional historical plots for each parameter.

P2 EVIDENCE OF THE 1997-1998 EL NIÑO IN THE FISH COMMUNITY OFF SAN DIEGO.

R. Gartman, A. Groce. City of San Diego, Ocean Monitoring Program, San Diego, CA 92106.

The City of San Diego has monitored the San Diego coastal marine environment since 1962, as part of a National Pollutant Discharge Elimination System (NPDES) permit. Data are collected for a number of physical and biological parameters: physical parameters include routine water quality measurements such as temperature, salinity and transmissivity, and biological parameters include periodic surveys of demersal fish communities from local, soft-bottom substrate habitats. These data provide strong evidence of the large scale ENSO event of 1997-1998. For example, a large influx of water with elevated temperatures was found in the sampling area, starting in August 1997. Fluctuations in the local fish communities were found coincident with these changes in water temperature. These changes included higher numbers of some species typically associated with warmer water temperatures, and lower numbers of some species typically associated with cooler temperatures. In addition, several incidents were recorded of unusual species, including northern range extensions for the calico lizardfish, *Synodus lacertinus*, and the speckletail flounder, *Engyphrys sanctilaurenta* (among others).

P3 CHANGES IN DIET OF TERNS AND SKIMMERS NESTING AT THE BOLSA CHICA ECOLOGICAL RESERVE IN SOUTHERN CALIFORNIA: POSSIBLE RESPONSES TO CLIMATE CHANGE AND SHIFTS IN PREY POPULATIONS

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The Bolsa Chica Ecological Reserve in southern California has been the nesting site of several species of tern and the Black Skimmer in recent years. We have documented changes in diet of these birds, based on dropped fish, that appear to be related in part to ocean warming and shifts in abundance and distribution of their prey. For the Elegant Tern diet, the ratio of Northern Anchovy to Pacific Sardine, two major prey items, declined steadily from 24.8:1 in 1993 to 0.6:1 in 1997, paralleling a decline in the cooler-water anchovy and an increase in the warmer-water sardine. However, in 1998, this tern failed to nest at the site and, in 1999, reverted to a diet marked by a 25:1 anchovy-sardine ratio. This apparent reversal in diet was not paralleled by a reversal in abundance of the anchovy and sardine, but may have been related to inshore-offshore differences in distribution of these two prey species. Caspian Tern and Black Skimmer, with more diverse diets than Elegant Tern, shifted gradually toward fewer anchovy and more sardine in their diets from 1993 to 1998.

P4 DECLINE OF SPECIES DIVERSITY AND STANDING STOCK AT LITTLE CORONA DEL MAR'S ROCKY INTERTIDAL, SOUTHERN CALIFORNIA.

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Comparative longitudinal transect meter line surveys were made evaluating the species diversity and standing stock of the four littoral zones of the rocky intertidal in Little Corona del Mar (LCM). These results were compared to identical surveys at three other sites along the Orange County Coast (Crystal Cove State Park, Victoria Beach and Three Arch Bay). This study began in December, 1998 and continued to February, 2000. LCM species diversity and standing stock was consistently found to be less compared to the other locations. Fewer numbers of taxa are found at

LCM. Adult Owl Limpets (*Lottia gigantea*) were absent at LCM, but abundant at Three Arch Bay. Rockweed (*Pelvetia fastigata*) is missing at LCM, yet thrives at Three Arch Bay. Healthy symbiotic relationships known to exist in California's rocky intertidal habitats are not visible. The Three Arch Bay site is located upon limited access private property, whereas LCM is a highly trafficked area. High human traffic appears to have a direct impact on the loss of species and standing stock in the rocky intertidal. The loss of species diversity and standing stock becomes even more apparent when compared to similar studies conducted at LCM in the 1970's (Littler, 1977).

P5 DIET PREFERENCE HIERARCHY OF THE JUVENILE SEA HARE, *APLYSIA CALIFORNICA* COOPER.

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The feeding preference of the sea hare, *Aplysia californica*, was tested on juvenile individuals (2-5cm long) by using a no-choice feeding experiment. Based on the juveniles' consumption rates, a diet preference hierarchy was constructed ranking *Plocamium cartilagineum* first among six seaweeds. The juveniles did not eat the brown seaweeds, but eagerly consumed the red seaweeds. ANOVA revealed that there was a significant difference ( $p < 0.05$ ) in the amount of each algae consumed. The mean consumption rate for *Plocamium* was  $0.0322 \pm 0.0112$  grams eaten per day and was 4 to 27 times higher than the two other red seaweeds used. The diet preference hierarchy constructed in this experiment was compared to that of the adult *Aplysia californica* known from previous studies. Results agreed with the hypotheses that (1) the juvenile diet preference hierarchy will be similar to that of the adults and (2) juveniles will not eat brown seaweeds, such as *Zonaria farlowii* and *Egrecia menziesii*.

P6 DISCOVERING OLD ANEW: UNPUBLISHED MUSEUM MATERIAL ALTERS THE "KNOWN" GEOGRAPHIC RANGE OF MARINE INVERTEBRATES.

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Recently 12 species of intertidal or shallow subtidal marine invertebrates (11 mollusks and 1 ophiuroid) have been observed well beyond their normal geographic range along the California coast. Unpublished museum material for four species provided new records beyond those reported in the literature or found at our study sites, and in each case extended the range in the same direction as material collected at our study sites. In addition, conflicting published range limits for *Norrisia norrisi* and *Pteropurpura festiva* were resolved by museum material. Because current range data, and especially published range records, are likely incorrect for all but a few well studied species, it is possible that a significant number of recently discovered and reported range expansions are the result of incomplete knowledge and search artifacts rather than species responding to climate change. If our findings are indicative of other taxa, then species records and the extent of occurrence are poorly known. Researchers that rely upon field guides for range data or are unaware of museum material and published ranges, may underestimate true species ranges and make incorrect inferences regarding how and when species arrived at extralimital sites.

P7 HYDROGEOLOGY AND HYDROCHEMISTRY OF THE ANIMAS BASIN AQUIFER SYSTEM, SOUTHWESTERN NEW MEXICO

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The Animas Basin aquifer system comprises an interconnected group of subbasins that include the Lower Animas Subbasin, the Upper Animas Subbasin and the Cloverdale Subbasin. The aquifer system is entirely in the Mexican Highland section of the Basin and Range physiographic province. Water bearing strata in the basin system includes consolidated bedrock units in the highlands and Tertiary and Quaternary basin (bolson) fill units in the low-lying areas of the basin. Recharge to the aquifer system occurs mostly from ephemeral recharge along mountain fronts. The other major source of recharge is water percolating through thinner parts of the vadose zone beneath the system's only major axial drainageway, Animas Creek. Groundwater flows south to north by interbasin flow from the Cloverdale Subbasin, through the Upper and Lower Animas Subbasins, to the Gila River Valley. Hydrochemical data indicate an apparent evolutionary hydrochemical trend along this flowpath. Groundwater evolves from calcium and bicarbonate rich waters, to sodium, bicarbonate, and chloride rich waters, to sodium, sulfate, and chloride rich waters as groundwater flows south to north. These changes indicate dissolution of calcite in the Cloverdale and

Upper Animas Subbasins, followed by the exchange of calcium for sodium on clay minerals, and simultaneous dissolution of gypsum as groundwater moves northward into the Lower Animas Subbasin. Infiltration of runoff along flanking mountain fronts also dissolves halite in soil profiles and carries salts into the basin-fill aquifer.

**P8 TO MULCH OR NOT TO MULCH: A REPORT ON VARIOUS METHODS OF WEED CONTROL ON A RESTORATION SITE**

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The Puente-Chino Hill corridor extends from the southeastern portion of Los Angeles County to the Cleveland National Forest in the Santa Ana Mountains. These hills historically supported a mix of coastal sage scrub, oak woodland and mixed oak and walnut woodland. Currently, we are involved in re-establishing an oak walnut woodland on a north facing slope in an abandoned avocado grove in the corridor within the city of La Habra Heights. This area has been under cultivation for several decades and supports a rich array of non-native invasive annual species. A total of 39, 400m<sup>2</sup> experimental plots were established on the site to monitor the relative effects of several treatments in an effort to control the non-native weeds. Weeds were sampled by counting the number of weeds in three 100.00 cm<sup>2</sup> sub-plots within a one meter square frame. A total of five frames were sampled for each experimental plot. There were a total of three different types of treatments-- mulch, annual rye seeding, and no treatment. Treatments were applied alone and in combination. Mulch was labor intensive to apply but was most effective alone or in combination with rye, reducing the number of weeds by as much as 60%. Seeding with rye without mulch had little effect on the total number of weeds. Previous studies have shown that mulch may depress the growth of planted native species; however, our study suggests that mulch is an effective means of controlling weeds for future seeding of native species.

**P9 CUTTING COSTS: THE EFFECTIVENESS OF REVEGETATION ON ABANDONED OIL WELL SITES IN THE PUENTE-CHINO HILL CORRIDOR**

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Much of Southern California's coastal sage scrub (CSS) habitat has been eliminated as a result of agricultural and urban development. The Puente-Chino Hill corridor extends from southeastern Los Angeles County through northeastern Orange County containing much of the remaining CSS in Los Angeles County. Since the 1900s, oil companies, including Chevron and Unocal, extracted large amounts of crude oil from this area. Throughout the 1980s, oil well sites were abandoned, and the City of Whittier purchased much of this land in an effort to preserve the remaining open space in this corridor. As a result of the oil extraction activities, much of the CSS is fragmented with roads and abandoned well sites. Revegetating these degraded areas is important to maintaining and improving wild-life habitat and decreasing the extensive fragmentation of the remaining CSS. We compared plant species composition and diversity on abandoned well sites where soil remediation and revegetation had been implemented, and abandoned well sites that had not been actively revegetated. There was no significant difference in the density of native species relative to non-native species between the revegetated and non-revegetated well sites. Revegetated well sites had a higher diversity of native species relative to non-revegetated wells, but there was no significant difference in the total cover of native species. While hydroseeding increases species diversity, it does not significantly increase the cover of native species, and the funds spent on revegetation may be better spent on other conservation projects.

**P10 RATES OF GROWTH AND MORTALITY ON COAST LIVE OAKS, CALIFORNIA WALNUTS AND TOYON**

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In May and June of 1999, 900 coast live oak, toyon and California walnut individuals were planted on a five acre site at the southern edge of Los Angeles County in the Puente-Chino Hill corridor. The site is an abandoned avocado ranch bordered by undisturbed woodland dominated by these species. A number of oak and walnut seedlings can be found in the litter beneath the woodland canopy. We set up 39 400 m<sup>2</sup> plots with different treatments focused on weed control including spreading mulch. We then tagged individuals in order to monitor the production of leaves and elongation of stems to test for any negative effects of mulch on growth. We also measured the height of the seedlings in order to compare the growth of self-established seedlings to the container plants we installed. We also monitored mortality of planted shrubs in order to document overall mortality, assess the cost effectiveness of installing anti-herbivore caging, and determine the sources of mortality. The results of the growth measurements suggest that mulch

has a positive effect for coast live oaks, increasing the mean number of leaves produced and the mean stem elongation. Toyon and California walnut did not respond in a similar fashion and showed decreased leaf production and stem elongation in mulched plots. Sources of mortality differed over the course of the year. Deer were responsible for the largest percentage of mortality early in the season, but gophers were responsible for the majority of the mortality later in the season.

P11 ENDOHELMINTHS OF WHITE CROAKER FROM THE LOS ANGELES HARBOR AREA, SOUTHERN CALIFORNIA

J. Peng and C. Hogue, Department of Biology, California State University, Northridge, CA, 91330-8303

*Genyonemus lineatus*, white croaker, is an important commercial and sport fish. It is common along the Southern California Bight and thrives in degraded environments like that found in Los Angeles Harbor. It has been a target species for pollution monitoring studies that assess the effects of pollution on demersal fish populations. We incorporated aspects of the population biology of endohelminths of croakers into an understanding of the relationships between pollution and parasitism in these fish. A total of 468 white croaker were collected from several sites within and outside the harbor from 1997 to 1999. These sites varied in their distance from a sewage treatment plant outfall pipe that discharges effluent into the harbor. Four helminth groups dominated the macroparasite fauna of croaker: cestodes (prevalence of 90%), nematodes (63%), acanthocephalans (44%), and digeneans (43%). Season and host age and size significantly affected prevalence and abundance of cestodes, nematodes, and digeneans. Helminth intensity was highest in croakers in winter and spring seasons and lowest in summer and fall. Overall, older and larger hosts harbored greater numbers of helminths. Cestodes and digeneans were more common in female croakers than male fish. Croakers collected from the least contaminated site, the site furthest from the outfall pipe, showed higher parasite species richness, prevalence, and abundance compared to sites closer to the outfall.

P12 MACROPARASITES OF PACIFIC SANDDAB FROM POLLUTED WATERS OF THE PALOS VERDES SHELF, SOUTHERN CALIFORNIA

J. Paris and C. Hogue, California State University, Northridge, Department of Biology, Northridge, CA 91330-8303.

Pacific sanddab (*Citharichthys sordidus*) is a pollution-tolerant flatfish that inhabits the waters off White Point, part of the Palos Verdes Shelf. In this area, this fish is often associated with bottom sediments that contain high levels of DDT, PCBs and heavy metals. Pacific sanddab is an opportunistic omnivore that feeds at the sediment surface and consumes a variety of invertebrates as well as juvenile fish. This has resulted in a diverse macroparasite fauna, at least 10 parasite taxa infect this sanddab species. A total of 162 Pacific sanddab were collected from the waters off White Point. The endohelminth infracommunity of Pacific sanddab was dominated by immature stages of parasites including juveniles of the nematode *Anisakis* (encysted in both the mesentery and the musculature), acanthocephalans, and flatworms. Ectoparasite groups found on sanddabs were less common and included the eye copepod *Phrixocephalus cincinnatus* and isopods. This study reports the seasonal prevalence and abundance of macroparasites of Pacific sanddab and addresses the impacts of pollution on parasitism in this host.

P13 AGE, GROWTH, AND MATURITY OF THE LONGFIN SANDDAB (*CITHARICHTHYS XANTHOSTIGMA*) OFF SAN DIEGO, CALIFORNIA.

A. Groce<sup>1,2</sup>, C. Jenkins<sup>2</sup> <sup>1</sup>City of San Diego, Ocean Monitoring Program, San Diego CA 92104; <sup>2</sup>San Diego State University, San Diego, CA 92182

The age, growth, and maturity of longfin sanddabs (*Citharichthys xanthostigma*) was investigated off San Diego during 1999. All fish were collected during trawl surveys performed by the City of San Diego's Ocean Monitoring Program in 1999. These surveys were conducted semiannually (January and July) at three inshore stations along the 60 m depth contour and quarterly (January, April, July and October) at eight offshore stations located along the 100 m contour. Fish were collected using a standard otter trawl net with a 1.3 cm cod-end mesh. After collection, gonads were extracted and weighed, and otoliths were removed for examination.

Results to be discussed include 1) allometric relationships for each sex; 2) size and age at maturity; 3) seasonality of gonadal and somatic indices for females; 4) age-length relationships, including Von Bertalanffy growth parameters.



P14 MERISTIC AND MORPHOLOGICAL VARIATION AMONG CALIFORNIA POPULATIONS OF THE MARINE SILVERSIDE FISH, *Atherinops affinis* (TELEOSTEI: ATHERINOPSIDAE)

O'Reilly, K.M., and M.H. Horn. Department of Biological Science, California State University, at Fullerton, P.O. Box 6850, Fullerton, CA 92834-6850.

The phenotypic variation of *Atherinops affinis* was examined to test the hypothesis that populations of this species from central and southern California coastal waters and from one of the Channel Islands are distinct based on meristic and morphometric characters. Significant meristic variation was found among the five populations studied, but they showed no clinal or island-mainland pattern. Significant morphological variation was found among the four populations examined based on principal component (PCA) and canonical analysis of discriminance. Head length, body depth, caudal peduncle depth, and snout length accounted for most of the morphological variation between the central California (Elkhorn Slough), Channel Island (Santa Catalina Island), and two southern California mainland populations (Newport Beach). The upper Newport Bay estuarine population had deeper bodies and longer snouts than the outer Newport coast population 10 km away. A geometric morphometric shape analysis of four *A. affinis* populations is underway. This analysis is expected to reveal finer resolution of the morphological variation among these populations and, possibly, to provide new insights into the phenotypic plasticity of this atherinopsid fish.

P15 HIGH CREATINE PHOSPHOKINASE ACTIVITY IN THE WHITE MUSCLE OF THE ENDOTHERMIC MAKO SHARK.

G. Lopez & K. A. Dickson, Department of Biological Science, California State University at Fullerton, Fullerton, California 92634-9480, USA

Endothermy, the ability to use metabolic heat to maintain elevated tissue temperatures, is found in only a few species of fish, the tunas, billfishes and certain elasmobranchs. All of these endothermic fishes are active pelagic predators, and endothermy has been hypothesized to enhance swimming performance. In this study, a biochemical index of anaerobic metabolic capacity in the fast-twitch, glycolytic (white) myotomal muscle of several shark species was measured – the activity of the enzyme creatine phosphokinase (CPK). The white muscle is specialized to power accelerations and high-speed bursts but requires rapid ATP production. CPK catalyzes the transfer of high-energy phosphate from creatine phosphate to ADP, rapidly producing ATP for muscle contraction. The endothermic shortfin mako shark, *Isurus oxyrinchus*, has a significantly greater CPK activity at 20°C in white muscle than do active ectothermic sharks *Carcharinus acronotus*, *Prionace glauca*, *Rhizoprionodon terraenovae*, *Sphyrna tiburo* and *Alopias vulpinus*. This suggests that the shortfin mako has a greater capacity to produce ATP very rapidly through the CPK pathway during short-duration, high-speed bursts and may result in the mako having greater burst swimming speeds or durations relative to the ectothermic sharks studied.

P16 HERETOFORE UNDOCUMENTED VARIATION OF THE INTRINSIC HAND MUSCULATURE IN A JUVENILE BABOON

K. C. Noriega, Joint Science Department, The Claremont Colleges, Claremont, CA 91711

The opposability of the thumb and hand are frequently cited as key adaptations of humans, and their anatomical correlates have been suggested as uniquely human characters. Recently, it has been suggested that the range of skeletal variation in the digits of non-human primates overlap that which is associated with potential thumb and hand opposition in humans. Thus, an understanding of both the muscular and skeletal structures that could be associated with thumb and hand opposability in all primates has become critical to this question.

Standard anatomical references for primate anatomy focus almost exclusively on adult morphology and rarely document the range of variability within structures. Traditional descriptions of the opponens digiti minimi muscle in the baboon (*Papio* sp.) show it as a single head originating from the flexor retinaculum and passing to the head of the fifth metacarpal. Dissection of a juvenile specimen demonstrates heretofore undocumented variation in this muscle. The specimen examined possesses an accessory head to the opponens digiti minimi muscle running transversely across the palmar ulnar aspect of the hand. The deeper transverse head retains the traditional origin at the flexor retinaculum whereas the more superficial head originates primarily from the palmar aponeurosis. The insertion of the transverse head is much more extensive, attaching to the majority of the ulnar aspect of the fifth metacarpal. This is more similar to the pattern in *Homo sapiens*, a species with clearly acknowledged ability to oppose the thumb and hand.

P17 ASSOCIATION STUDY OF THE B3-ADRENERGIC RECEPTOR POLYMORPHISM WITH RISK FACTORS FOR COLON CANCER

D.H. Nguyen<sup>1</sup>, R.C. Bada<sup>1</sup>, R.W. Haile<sup>1</sup>, H.D. Frankl<sup>2</sup>, E.R. Lee<sup>3</sup>, S.A. Ingles<sup>1</sup>. 1) Preventive Medicine, USC/Norris Cancer Center, Los Angeles, CA; 2) Division of Gastroenterology, Sunset Kaiser Permanente Medical Center, Los Angeles, CA; 3) Division of Gastroenterology, Bellflower Kaiser Permanente Medical Center, Los Angeles, CA.

The B3-adrenergic receptor (B3-ADR) is expressed in visceral adipose tissue in humans, which functions as a lipid oxidizer, regulator of thermogenesis, and regulator of resting metabolic rate. Studies have identified the B3-ADR polymorphism as a factor in obesity in different ethnic cohorts. Our hypothesis is that carriers of the B3-ADR polymorphism may have an increased BMI (body-mass index), insulin levels, triglyceride levels, and an increased likelihood for polyp development (a precursor to colon cancer). The subjects include a case group of 323 subjects with polyps, and a control of 332 subjects without polyps. All subjects were 50+ years of age and underwent sigmoidoscopies. 55% were Caucasians, 16% African American, 17% Hispanic, and 12% Asian. Methodology involved polymerase chain reaction amplification and enzyme digestion, concluding with electrophoresis separation. Results from BstNI enzyme digestion genotyping show that carriers of the mutation who were obese had a higher risk of colorectal adenomas (polyps). Carriers also had higher, but insignificant, levels of insulin and triglycerides. Results show that the risk factors are higher in men than in women.

P18 PRELIMINARY OBSERVATIONS ON MARINE MAMMALS IN THE SANTA MONICA BAY, CALIFORNIA

Maddalena Bearzi<sup>1</sup>, Brigitte Steinmetz<sup>2</sup>, <sup>1</sup> University of California, OBEE, Los Angeles, CA 90095 <sup>2</sup>Ocean Conservation Society, Los Angeles, CA 90295

In the years 1996-99, a total of 114 boat-based surveys were conducted in the Santa Monica Bay, including 14 long-range surveys to Santa Barbara and Catalina Islands. We spent 16,055 min searching for cetaceans during good weather conditions (Sea 0-2 Beaufort, Sea state = 0), 1,541 min navigating with unfavorable conditions (Sea >2 Beaufort, Sea state = 1), and 8,270 min collecting 5-min behavioral samples on various species of dolphins and whales.

The total number of cetacean sightings during the study period was 170, including nine cetacean species. The species most frequently sighted, in terms of number of schools and year-round presence, were bottlenose dolphins, *Tursiops truncatus*, (54.7% of total sightings) and short- and long beaked common dolphins, *Delphinus* spp., (23.2%). Pacific white-sided dolphins, *Lagenorhynchus obliquidens*, and Risso's dolphins, *Grampus griseus*, were also found in the Bay, although less frequently as well as minke whales, *Balaenoptera acutorostrata*. Gray whales, *Eschrichtius robustus*, were observed only during their winter migrations. Dall's porpoises, *Phocoenoides dalli*, and Blue whales, *Balaenoptera musculus*, were spotted once during offshore surveys. A total of 649 pinniped sightings, relating to 3 different species, were also recorded.

Nine mixed-species cetacean schools (5.0% of total sightings) and 55 schools including both cetaceans and pinnipeds (33% of total sightings in 1997-99) were recorded. Seabirds were seen in aggregation with cetaceans 105 times (61.8%).

This study represents the first long-term longitudinal study conducted in the Santa Monica Bay, CA.

P19 GENETIC VARIATION IN THE EASTERN PACIFIC BAY PIPEFISH, *SYNGNATHUS LEPTORHYNCHUS* (GASTEROSTEIFORMES: SYNGNATHIDAE).

K. D. Louie, K. P. Koepfli, and D. K. Jacobs. Department of Organismic Biology, Ecology and Evolution, University of California, Los Angeles, CA 90096-1606.

The bay pipefish, *Syngnathus leptorhynchus*, inhabits estuaries along eastern the Pacific from Alaska to Baja California. This pipefish is elongate, slender, and cryptic in its protective eelgrass habitat. Fishes of this species are specialized because females deposit their eggs directly into the brood pouch of a male, where they are fertilized, nourished, and protected until they hatch as free-swimming juveniles. Extensive morphometric and meristic variation has been found across the range of this species, causing both difficulty in identification and distinction from other pipefish species. Due to this morphological variation, specialized reproductive strategy, and affinity to eelgrass habitat, it is hypothesized that *S. leptorhynchus* may also exhibit both marked genetic variation and geographic structure. Using mitochondrial control region sequence data, this study examines the intraspecific variation and genetic structure of individuals of *S. leptorhynchus* from locations from southeast Alaska to southern California. Preliminary data suggest both genetic variation and geographic structure within the species.

P20 INTRASPECIFIC PHYLOGEOGRAPHY OF *ATHERINOPS AFFINIS* (TELEOSTEI: ATHERINOPSIDAE) FROM CALIFORNIA WATERS USING SEQUENCES OF THE MTDNA CONTROL AND NUCLEAR ITS-1 REGIONS

J. W. Cavanagh and M. H. Horn, Department of Biological Science, California State University, Fullerton, CA 92834

California's long, irregular coastline, embayments, and offshore islands provide opportunities for genetic variation to occur among populations of coastal marine organisms. A species occupying this extensive environment and beyond is *Atherinops affinis*, an abundant silverside fish with seemingly limited powers of dispersal. To examine genetic variation and population structuring in this widespread species, sequences from the left domain of the mtDNA control region were compared among four California populations from the central mainland (Elkhorn Slough), southern mainland (Upper Newport Bay and outer Newport coast), and Channel Islands (Santa Catalina Island). These sample sites span Point Conception, a recognized biogeographic boundary for which evidence is still scant as to whether it also acts as a phylogeographic boundary. The mtDNA analysis revealed little genetic variation among the four populations, a result in striking contrast to those obtained from morphological data. Work is underway to sequence portions of the nuclear ITS-1 (internal transcribed spacer) region to confirm the mtDNA control region data or to identify structuring among the *A. affinis* populations. Sequence results from the mitochondrial and nuclear DNA regions when compared with the morphological variation in the same *A. affinis* populations should provide insight into the mechanisms of phenotypic variation and gene flow in this species and other coastal marine fishes.

P21 GENETIC VARIATION IN VERNAL POOL CRUSTACEANS

Erin Bomcamp and Douglas Eernisse, Department of Biological Sciences, California State University, Fullerton, Fullerton, CA 92831-3599

Vernal pools are rain-filled seasonal ponds that support a wide assemblage of specialized plants and animals, including anostracan branchiopods, or fairy shrimp (Crustacea). The life history of fairy shrimp includes diapausing cysts that are released from the ovisac of females when the pools dry. Cysts are dispersed by migratory birds or cattle, and hatch in subsequent years in response to rain. Significant reduction of vernal pool habitat in California by agricultural and other development may be affecting genetic population structure by reducing spatial gene flow. Isolated populations of *Branchinecta lindahli* from Southern California were sampled to determine the extent of genetic polymorphism and the population structure.

P22 WATER QUALITY IN THE SAN GABRIEL RIVER, LOS ANGELES, CA

J.G. Hering, M.P. Bachmann, D.E. Giammar, A.M. Hyldahl, Y.P. Liu, T.M. Salmassi, California Institute of Technology, Environmental Engineering Science (138-78), Pasadena, CA, 91125

The watershed of the San Gabriel River ranges from wilderness to heavily developed urban areas. Consequently, inputs to the river vary from snowmelt in the forested uplands to treated sewage effluent and urban stormwater runoff in Los Angeles County. The river also has many uses including recreation, mining (both historical and, at present, recreational), drinking water supply, irrigation, conveyance for sewage and runoff discharges, and flood control. Water quality data have been collected from a variety of sources. These data are presented to summarize the state of knowledge regarding water quality in the San Gabriel River and to highlight the gaps in information needed to accommodate the many uses of this river.

P23 HERBARIUM DATABASES: CREATION AND MAINTENANCE

R. Schramm, Lichen Herbarium, Department of Plant Biology, Arizona State University, P.O. Box 87 1601, Tempe, AZ 85287-1601

The use of databases in herbarium management has become a vital tool in the organization and analysis of large collections. With a well thought-out structure, a database can yield a wealth of uses, ranging from the management of specimen loans and exchanges to the analysis of label data, localities, distribution map creation, and generating specimen labels. There is a wide selection of options in database programs that can facilitate uniformity in data entry such as combo boxes or "pull down menus" to catch spelling errors, update taxonomic name changes, and provide author names. Developing a barcode system for herbarium specimens has now become a relatively inexpensive method of accurately retrieving digital label data. Through the use of queries and reports one can quickly assess the exchange balances between institutions, generate invoices and manage outgoing and incoming loans. A database structure in Microsoft Access 2000, presently in use at the Arizona State University Lichen Herbarium is presented as an example.

## P24      LOCALLY RARE PLANTS OF VENTURA COUNTY

D. L. Magney, David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346

Rare and endangered species are paid a great deal of attention, especially listed species. However, little attention is given to locally rare species, such as on a county or regional basis. Part of this lack of attention is a result of the nature of political boundaries. E.g., California and Oregon are neighboring states; each is very different in its size, number of species, and biological diversity. California covers a much larger area and is more diverse topographically, geologically, and biologically. California has enacted a law to protect its rarest species; however, due to California's size and geographic position, the species that occur in one portion of the state may be common while the same species may be rare in another. California's Endangered Species Act does not take this into consideration, leaving some species that are rare in one part of the state with little to no protection from extirpation in a part of the state. The California Environmental Quality Act (CEQA), provides for consideration of locally rare or unique species. Consulting biologists rarely consider locally rare species during CEQA evaluations unless a list of these species has been published. The California Native Plant Society (CNPS) publishes its Inventory of Rare and Endangered Vascular Plants of California, looking at rare plants from a statewide perspective. Recognizing that many plants are locally rare, CNPS is developing lists of plants of local concern so decisionmakers will in fact consider land use, management, and project-related impacts on the local flora. As part of this project, the author has prepared a preliminary list of locally rare plants of Ventura County.

## P25      VENTURA COUNTY VASCULAR PLANT SPECIES OF LOCAL CONCERN,

David Magney, David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346

No Abstract

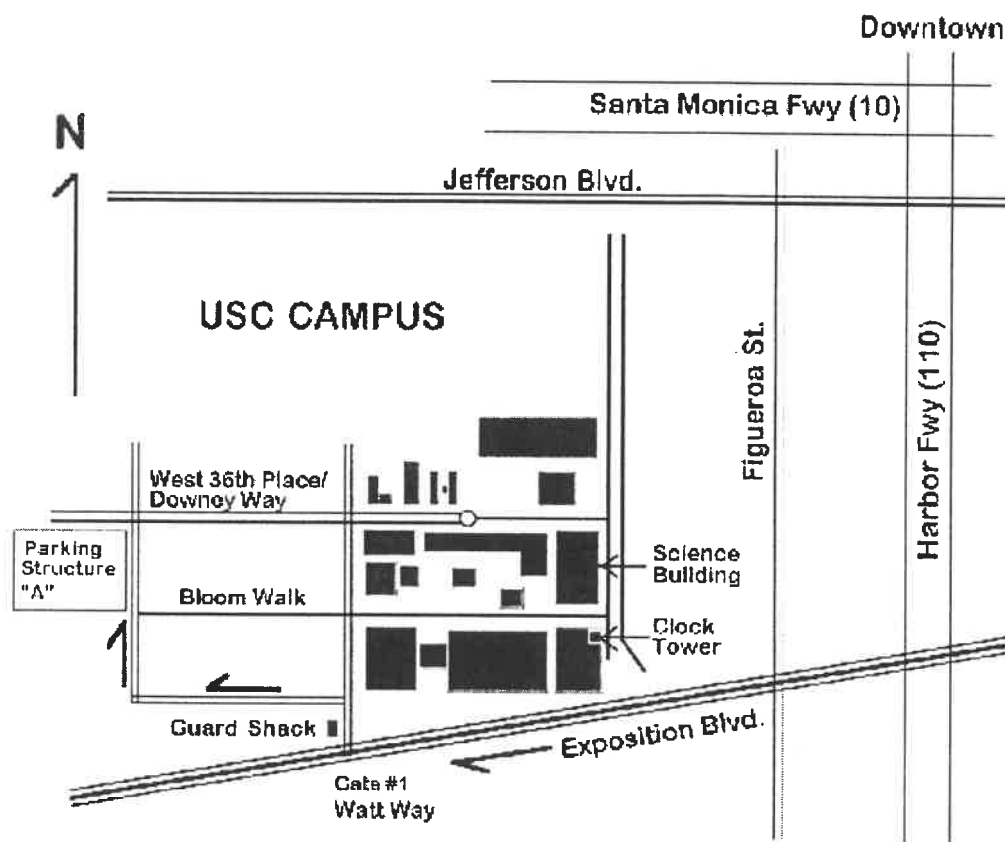
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# Map to the USC Department of Earth Sciences (Science Building)

Stauffer Lecture Halls are on Bloom Walk west of Science Hall (small block attached to large block at west

end of cluster)



**Directions:** From the Harbor Freeway (110) South or North, exit at Exposition Blvd. Continue WEST on Exposition; turn RIGHT into Gate #1 at Watt Way. Give the attendant your name and destination (Earth Science Dept.). The guard will give you a parking pass and directions to Parking Structure "A" (PSA). Exit the parking structure from the southeast stairwell, cross the street and follow Bloom Walk (a wide concrete path) across campus to the Clock Tower and Trousdale Parkway (the main campus walkway). The Earth Science Department is in the Science Building (SCI) located on the northwestern corner of Bloom Walk and Trousdale Parkway.

Please send e-mail to [scas@usc.edu](mailto:scas@usc.edu).

Last modified: November 22, 1999.

Southern California Academy of Sciences at USC

## **ANNOUNCEMENTS**

As of April 14, 2000

**THE GUILD OF NATURAL SCIENCE ILLUSTRATORS,  
SOUTHERN CALIFORNIA CHAPTER  
WILL HAVE THEIR WORK ON DISPLAY AT THE RECEPTION/POSTER SESSION, 5 -  
7PM FRIDAY, MAY 19, IN THE COMMONS RESTAURANT**

**Dr. Wheeler North, Professor Emeritus, Cal Tech, will be the Keynote Speaker at the Friday Morning Plenary Session.**

**The Saturday Plenary Speaker will be Dorothy Green, Founding President, Heal the Bay and who now serves as President of the LOS ANGELES & SAN GABRIEL RIVERS WATERSHED COUNCIL.**

**Programs are now listed. Please check to see if title is correct. Also note that room assignments will be inserted April 19.**

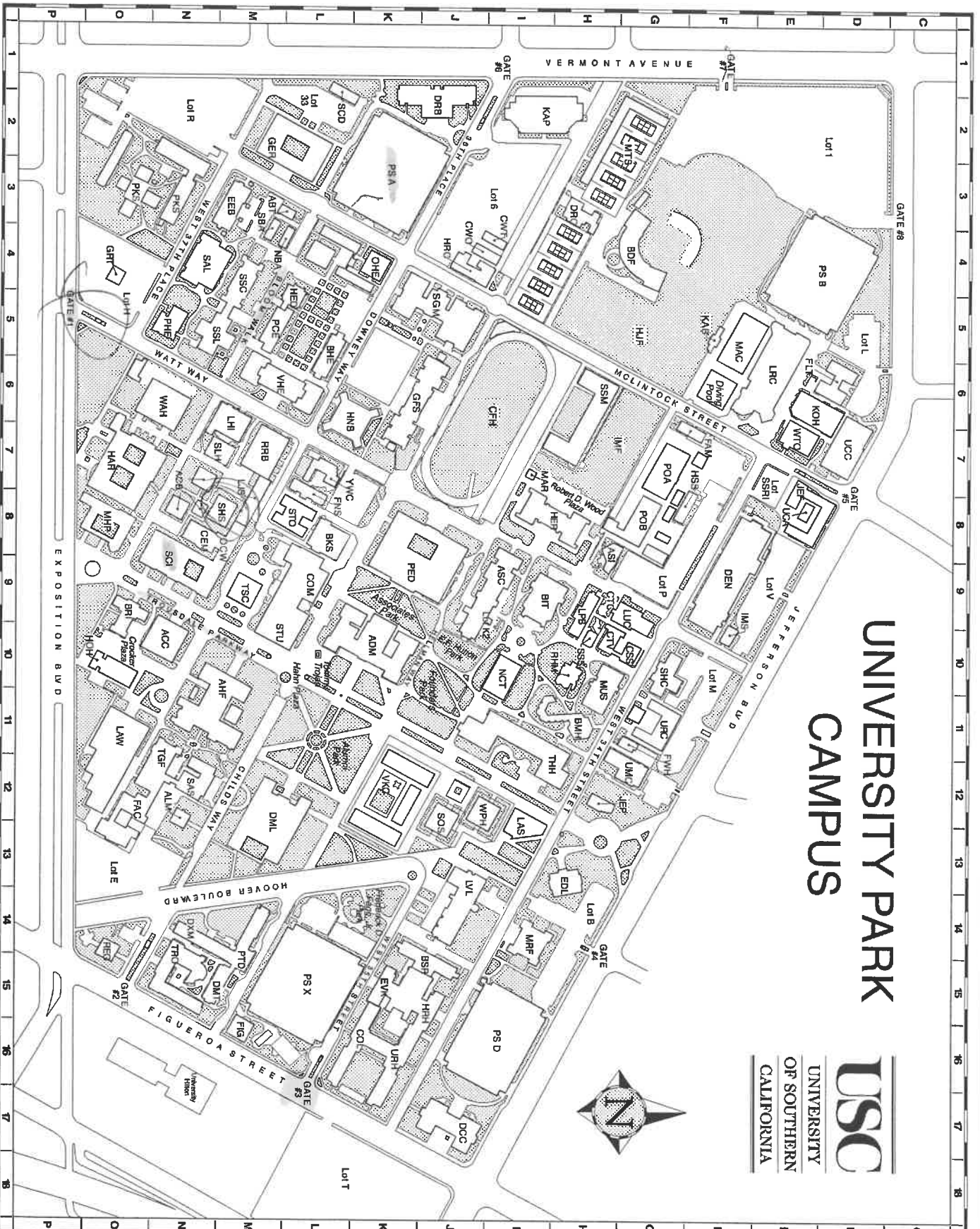
**PARKING - Parking is available on the boundary city streets (Jefferson, Figueroa, Exposition, Vermont) at metered spaces which charge \$0.25/hour, maximum capacity 4 hours. Parking on campus is \$6 with return priveleges. In summer (post Commencement, May 12) the entrance gates on Jefferson and Figueroa are open and the gate on Exposition is open week days. There is also parking at \$3 on Figueroa north of the Sizzler and this lot will be open Friday and Saturday of the meeting. This is probably the best choice. The attendants will direct you to Stauffer Lecture Halls.**

**FOOD - Food service is available on campus at the Commons, and Figueroa has every fast food source known to humankind. There is also a cafeteria at the State Museum of Science and Industry. University Village north of campus also has foodservices.**

**Coffee, lemonade and cookies will be available at the program breaks at the Stauffer Patio registration area. The reception/poster session Friday evening in the Commons upstairs restaurant will be "wine and cheese".**

**REGISTRATION WILL BEGIN AT 7:45 AM EACH DAY. SESSIONS BEGIN AT SEVERAL TIMES, WITH THE EARLIEST BEGINNING AT 8:15AM.**

# UNIVERSITY PARK CAMPUS





## *Award for Best Student Paper in Fisheries Biology*



### **American Institute of Fishery Research Biologists SOUTHERN CALIFORNIA DISTRICT**

For the past nine years, the AIFRB Southern California District has offered awards to honor graduate and undergraduate students for fisheries-related papers presented at annual meetings of the Southern California Academy of Sciences. Once again, we are proud to be able to award the efforts of student fishery research biologists at the 2000 annual meeting. Student presenters will be judged by a panel of AIFRB members and the recipient will receive a certificate and a check for \$200.

#### **PAST AWARD RECIPIENTS:**

- 1999 - Fredrik Stengard, University of South Florida
- 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

The American Institute of Fishery Research Biologists is a professional organization with a membership of approximately 1000. Established in 1957, the Institute was founded to promote conservation and proper utilization of fishery resources through the application of fishery science. The Institute pursues this goal through advancing the theory, practice and application of fishery biology and related sciences, by maintaining and promoting high professional standards of conduct for practitioners of fishery science, and by recognizing outstanding achievement and competence by fishery scientists. Membership is available to qualified individuals with formal training and demonstrated competence and achievement in the field of fishery science and research. Applicants meeting qualifications are admitted at either Associate, Member or Fellow (highest) rank.

The Southern California District of AIFRB meets from three to five times a year in San Juan Capistrano (a central location for our Los Angeles to San Diego members). This informal gathering brings together fishery scientists from across southern California for a social hour, dinner, and an always interesting scientific presentation by a member or guest. The District conducts symposia and short courses, and sponsors awards to honor excellence in fisheries science evidenced at the student and the professional level.

For more information on District meetings and activities, and to get to know fellow fisheries scientists in the southern California area, contact Dr. Michael G. Hinton, District Director, at (858) 546-7033, or at [mhinton@ucsd.edu](mailto:mhinton@ucsd.edu). Or visit our web site at [www.aifrb.org](http://www.aifrb.org).

## Restaurants in the University Park Community

### Locational Map of Restaurants

The University Park Community features a diverse array of eating establishments, some catering to specific ethnic groups (e.g. Latino, African-American, Asian) while others are more generic chains (Burger King, Del Taco etc.). Most are clustered along commercial arteries, especially Figueroa. Below is a list of local restaurants.

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• 1. Burger King, 1662 W Martin Luther King Jr Boulevard, (213) 296-1159.</li> <li>• 2. Burger King, 911 W Jefferson Blvd, (213) 747-1880.</li> <li>• 3. Carl's Jr., 1001 W Martin Luther King Jr Boulevard, (213) 731-2936.</li> <li>• 4. Carl's Jr., S Figueroa.</li> <li>• 5. Chanos, S Figueroa.</li> <li>• 6. Chinatown Express, S Figueroa.</li> <li>• 7. Del Taco, S Figueroa.</li> <li>• 8. Deli King, S Figueroa.</li> <li>• 9. Denny's, 821 W Jefferson Blvd, (213) 748-8458.</li> <li>• 10. Domino's Pizza, S Figueroa.</li> <li>• 11. El Pollo Loco, S Figueroa.</li> <li>• 12. El Rey Tacos, 1358 W Martin Luther King Jr Boulevard, (213) 296-2519.</li> <li>• 13. Express Chicken, 3575 S Western Avenue, (213) 732-4969.</li> <li>• 14. Fatburger, 3021 S Western Avenue, (213) 734-7490.</li> <li>• 15. Golden Bird Fried Chicken, 1734 W Adams, (213) 733-9191.</li> <li>• 16. Grinder, 3031 S Figueroa, (213) 765-9188.</li> <li>• 17. Headliners, 621 W Jefferson Blvd, (213) 746-1284.</li> <li>• 18. Healthy Kitchen, S Figueroa.</li> <li>• 19. Hong Kong Food Express, 2604 S Vermont, (213) 732-1318.</li> <li>• 20. Hot Burger, 3781 1/2 S Western Avenue, (213) 731-3138.</li> <li>• 21. Jack in the Box, 1441 W Martin Luther King Jr Boulevard, (213) 290-2520.</li> <li>• 22. Jack in the Box, S Figueroa.</li> <li>• 23. Julie's Trojan Barrel, 3724 S Figueroa, (213) 499-2575.</li> <li>• 24. Kentucky Fried Chicken, 3850 S Figueroa, (213) 748-0397.</li> <li>• 25. Kentucky Fried Chicken, 1425 W Martin Luther King Boulevard, (213) 291-4322.</li> </ul> | <ul style="list-style-type: none"> <li>• 26. La Barca, 2415 S Vermont, (213) 735-6567.</li> <li>• 27. Margarita Jones' Restaurant, 3760 S Figueroa, (213) 499-2575.</li> <li>• 28. McDonald's, 1071 W Martin Luther King Jr Boulevard, (213) 747-4400.</li> <li>• 29. McDonald's, S Figueroa.</li> <li>• 30. Mikoshi Japanese Noodle House, S Figueroa.</li> <li>• 31. Mr. X's Restaurant, 1427 W 24th St, (213) 731-2116.</li> <li>• 32. Olympian Burger, 2107 S Vermont, (213) 735-0599.</li> <li>• 33. Pasta Roma, S Figueroa.</li> <li>• 34. Pete's Burgers, 2400 S Hoover, (213) 748-3206.</li> <li>• 35. Popeye's Chicken, 2532 S Figueroa, (213) 745-8820.</li> <li>• 36. Popeye's Chicken, 3995 S Western Avenue, (213) 298-9028.</li> <li>• 37. Subway, 3974 S Figueroa, (213) 747-9779.</li> <li>• 38. Subway, University Village.</li> <li>• 39. Taco Bell, S Figueroa.</li> <li>• 40. Taco Bell, 1560 W Martin Luther King Jr Boulevard, (213) 296-7374.</li> <li>• 41. Taco Bell, 3629 S Vermont, (213) 737-4717.</li> <li>• 42. Tacos El Unico, corner Adams and Vermont.</li> <li>• 43. Ted's No. 3 Hamburgers, 1501 W Jefferson Blvd, (213) 734-2051.</li> <li>• 44. Togo's, 3619 S Vermont, (213) 730-2900.</li> <li>• 45. Trojan Brewhouse, University Village.</li> <li>• 46. 29th Street Cafe, 2827 S Hoover, (213) 745-6766.</li> <li>• 47. Two for One Pizza, 2528 S Figueroa, (213) 749-4515.</li> <li>• 48. University Village Cafeteria.</li> <li>• 49. Wendy's Hamburgers, 3019 S Hoover, (213) 746-8072.</li> <li>• 50. Yoshinoya Beef Bowl, S Figueroa.</li> <li>• 51. Yoshinoya Beef Bowl, University Village.</li> </ul> |
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Locational Map of Restaurants in the University Park Community



# UNIVERSITY PARK CAMPUS



# University Park Campus Map Legend

ABT	Annex Building II	3-L	FLT	Flour Tower	6-D	PKX	Parkside Apartments II	3-O
ACB	Ahmanson Center for Biological Research	8-N	FNS	Hazel and Stanley Hall Financial Services Building	8-L	PSA	Parking Structure A	3-K
ACC	School of Accounting	10-N	FWH	Freshman Writing House	11-G	PSB	Parking Structure B	4-D
ADM	Administration Building, Boward and Kenneth Norris Jr. Auditorium	10-K	GER	Ethel Percy Andrus Gerontology Center	2-M	PSD	Parking Structure D	16-1
AHF	Allan Hancock Foundation, Auditorium and Museum	11-N	GFS	Grace Ford Salvatori Hall	6-K	PSX	Parking Structure C	15-L
ALM	Alumni House (Widney Hall)	12-N	GRT	Greenroom Theatre	4-O	PTD	Pardee Tower	14-M
ASC	Annenberg School for Communication	9-1	HAR	Harris Hall	7-O	REG	Registration Building	14-O
ASI	Schoenberg Institute	8-H	HED	Hedco Petroleum & Chemical Engineering Building	5-L	RHM	Ramo Hall of Music	10-H
BDF	Brooks Memorial Pavilion and Dedeaux Field	4-G	HER	Heritage Hall	8-1	RRB	Rapp Engineering Research Building	7-M
BHE	Biegler Hall of Engineering	5-L	HJF	Howard Jones Field (Football Practice Field)	5-G	SAL	Salvatori Computer Science Center	4-N
BIT	Bing Theatre	9-1	HNB	Hedco Neurosciences Building	6-L	SAS	Student Administrative Services Building	12-N
BKS	Pertusati University Bookstore	8-L	HOH	Hoffman Hall of Business Administration	10-O	SBA	South Barracks	4-M
BMH	Booth Ferris Rehearsal Hall	11-H	HRC	Human Relations Center	4-J	SCD	Drama Scene Dock	2-L
BRI	Bridge Hall	9-O	HSS	Humanities and Social Sciences Annex	8-G	SCI	Science Hall	9-N
BSR	Birnkranz Student Residence	15-J	IMF	Intramural Field	7-H	SGM	Seeley G. Mudd Building	5-J
CAS	College Academic Services Building	13-I	IMS	Instructional Media Services	10-F	SHC	Student Health Center, Claire Zellerbach Saroni	10-G
CEM	Center for Electron Microscopy and Microanalysis	8-N	JEF	Jefferson Building	8-D	SHS	Stauffer Hall of Science	8-N
CFH	Cromwell Athletic Field	6-I	JEP	Joint Educational Project House	12-H	SLH	Stauffer Science Lecture Hall	7-M
COL	College Hall	16-L	KAB	Kennedy Family Aquatics Building	5-F	SOS	Social Science Building	12-J
COM	Commons Building	9-L	KAP	Kaprelian Hall	2-I	SSC	Seaver Science Center	4-M
CSS	Harold Lloyd Motion Picture Sound Stage	10-G	KOH	Frank L. King Dining Hall	6-E	SSL	Seaver Science Library	5-N
CTC	Cinema Television Center Complex	9-H	LAW	Law Center	11-O	SSM	Safety and Systems Management Building	6-H
CTV	Carson Television Center	10-H	LHI	Loker Hydrocarbon Research Institute	6-M	SSS	Spielberg Music Scoring Stage	10-H
CWO	Childs Way Building I	4-J	LJS	Stabler Memorial Hall	8-M	STO	Stonier Hall	8-L
CWT	Childs Way Building II	4-1	LPB	Lucas Post Production Building	9-H	STU	Gwynn Wilson Student Union	10-M
DCC	Davidson Conference Center	17-J	LRC	General William Lyon University Center	6-E	TGF	Town and Gown Foyer	12-N
DEN	Norris Dental Science Center	9-F	LUC	Lucas Instructional Building	9-G	THH	Taper Hall of Humanities	11-I
DML	Doherty Memorial Library	13-M	LVL	Thomas and Dorothy Leavey Library	14-J	TRO	Trojan Residence Hall	15-N
DMT	Marks Tower	15-M	MAC	McDonalds Olympic Swim Stadium	5-F	TSC	Norman Topping Student Activities Center	9-M
DRB	Denny Research Building	2-J	MAR	McAlister Academic Resource Center	7-I	UAG	University Art Galleries	8-O
DRC	Drama Center	3-H	MHP	Mudd Hall of Philosophy	8-O	UCA	University Computing Services Annex	8-E
DXM	Marks Hall	14-N	MRF	Montgomery Ross Fisher Building	14-I	UCC	University Computing Center	7-D
EDL	Education Library, Stoops	13-H	MTS	Marks Tennis Stadium	2-H	URC	University Religious Center	11-G
EEB	Hughes Aircraft Electrical Engineering Building	3-M	MUS	Music Faculty Memorial Building	10-H	URH	University Hall	16-K
EVK	Elizabeth von KleinSmid Memorial Residence Hall	15-K	NBA	North Barracks	4-L	UUC	United University Church	12-G
FAC	Faculty Center	12-O	NCT	Norris Cinema Theatre	10-I	VHE	Vivian Hall of Engineering	6-M
FAM	Facilities Management Building	7-F	OCW	Organic Chemistry Wing	8-M	VKC	Von KleinSmid Center for International and Public Affairs	12-K
FIG	Figueroa Building	16-M	OHE	Olin Hall of Engineering	4-K	WAH	Watt Hall of Architecture and Fine Arts	6-N
			PCE	Petroleum & Chemical Engineering Building	5-M	WPH	Waite Phillips Hall of Education	12-I
			PED	Physical Education Building	9-K	WTP	Webb Tower	
			PHE	Charles Lee Powell Hall of Engineering	5-N			
			PKS	Parkside Apartments I	3-N			

JUNIOR ACADEMY SESSION IS POSTED AT THE HIGH SCHOOL LINK.

Papers will have total of 20 minutes. Chairs are asked to keep speakers on schedule. See ANNOUNCEMENTS LINK for more speaker information. Lunch break will be from 12:00 - 1:20 Friday and Saturday. Wine & Cheese Reception and Poster Session will be Friday 5 - 7pm in the Commons Restaurant (see program below). The Guild of Natural Science Illustrators, Southern California Chapter, will display their work at the reception.

**REGISTRATION AREA WILL BE AT STAUFFER LECTURE HALLS (SEE VICINITY MAP AT DIRECTIONS LINK ON MAIN WEB PAGE).**

## FRIDAY, MAY 19, 2000

11:00 - 12:00 - **PLENARY SESSION**, Wheeler North, California Institute of Technology, Kelp beds of San Diego, Orange, and Los Angeles Counties - Past, Present and Future considerations

### **SYMPOSIA AND SESSIONS:**

#### **UNDERSTANDING THE URBAN INFLUENCE ON SANTA MONICA BAY**

Organizers: Homa J. Lee, U. S Geological Survey and Steven Bay, Southern California Coastal Water Research Program

##### Morning:

8:40 - Understanding the urban influence on Santa Monica Bay: An overview - S. B. Weisberg, M. Yamaguchi, M. Dojiri & H. J. Lee

9:00 - Submarine geomorphology of Santa Monica Bay from multi-beam sampling - J. V. Gardner & P. Dartnell (Read by Title)

9:00 - Coastal oceanographic controls on spatial and temporal variations in Holocene sediment accumulation, Santa Monica Bay - C. K. Sommerfield, H. J. Lee & C. R. Alexander

9:20 - Dispersal and accumulation of modern sediment on the Santa Monica shelf and slope - C. Alexander, C. Sommerfield & H. J. Lee

9:40 - Benthic faunal bioturbation effects on sediment mixing rates in Santa Monica Bay, California - J. A. Ranasinghe, C. Alexander & T. Phillips

10:00 - Characterizing benthic habitats of Santa Monica Bay by bottom photography - B. Edwards

10:20 - Spatial distribution of surficial grain size - M. Leecaster

10:40 - BREAK

11:00 - PLENARY SESSION

Afternoon:



- 1:20 - Temporal and spatial distributions of organic pollutants and trace metals in sediments of Santa Monica Bay, California - E. Zeng
- 1:40 - Toxicity of sediment cores from Santa Monica Bay - S. Bay, D. Greenstein, A. Jirik, J. Brown & C. Alexander
- 2:00 - Foraminiferal response to pollution and abatement in Santa Monica Bay, California - M. McGann
- 2:20 - Benthic infaunal assemblages of Santa Monica Bay in relation to habitat characteristics: a study using two analytical techniques - A. Dalkey, G. B. Deets, A. Ranasinghe & M. Dojiri
- 2:40 - Response of human cells (EPA method 4425) to extracts of sediment collected from Santa Monica Bay during So. Cal. Bight '98 - J. W. Anderson, J. M. Jones & D. L. McCoy
- 3:00 - BREAK
- 3:20 - Atmosphere deposition of pollutants to Santa Monica Bay - K. Schiff, K. Stolzenbach & L. Tiefenthaler
- 3:40 - Molecular markers as pollutant and natural source discriminants in Santa Monica Bay - T. D. Lorenson, J. J. Kolak, F. D. Hostettler, R. J. Rosenbauer, K. A. Kvenvolden & E. Zeng
- 4:00 - Stormwater input and integration into the water column of Santa Monica Bay: spatial and temporal characteristics of stormwater - B. H. Jones, M. A. Noble & J. Xu
- 4:20 - Shelf-break processes in Santa Monica Bay - M. A. Noble, J. Xu, C. Sherwood, P. Dartnell & H. J. Lee
- 4:40 - Clay mineral suites in Santa Monica Bay - J. R. Hein, J. S. Dowling, A. Schuetze & H. J. Lee
- 5:00 - Heavy minerals of sand-sized sediment, Santa Monica Bay - F. L. Wong & R. C. Lewis
- 5:00 - 7:00 - Poster Session/Wine & Cheese Party, Commons Restaurant

## **THE ECOLOGY OF KELP BEDS OF SOUTHERN CALIFORNIA**

Organizers: Dan Pondella, UCLA and Van Tuna Research Group, Robert Grove, Southern California Edison

Morning:

- 8:50 - Welcome & Introduction - D. Pondella & R. Grove
- 9:00 - Kelp bed fish: effect of a thermal effluent - M. L. Patton
- 9:20 - Permitting and construction of a kelp mitigation artificial reef - R. S. Grove & H. Elwany
- 9:40 - Kelp transplantation in the Southern California Edison Experimental Kelp Reef - L. Deysher & T. A. Dean
- 10:00 - Restoration of kelp beds - D. Pondella
- 10:20 - Fishes of the Palos Verdes Peninsula kelp beds - J. Stephens & D. Pondella
- 10:40 - BREAK

11:00 - 12:00 - PLENARY SESSION

Aftenoön:

1:20 - An overview of the kelp beds of Orange and San Diego counties in 1999 (with a review of the kelp beds from 1983-1998) - M. D. Curtis

1:40 - Patterns and consequences of spore dispersal in giant kelp *Macrocystis pyrifera* - D C. Reed, P. T. Raimondi & L. Washburn

2:00 - \*El Nino 1997-98: large-scale patterns of disturbance and recovery in giant kelp forests - M. S. Edwards

2:20 - Dispersal processes, local habitat features and patterns of nearshore reef fish assemblages within the California biogeographic province - D. M. Schroeder

2:40 - The nearshore fish assemblage of Santa Catalina Island - D. J. Pondella

3:00 - BREAK

3:20 - El Nino, 1997-1998: some thoughts on kelp beds and grazers - M. Tegner

3:40 - Biogeographics and ecological implications of kelp bed rafting as a dispersal vector for marine invertebrates - W. W. Bushing

4:00 - Assessing the effects of dive fishing on exploited populations of marine invertebrates using long-term monitoring data collected in protected and unprotected areas in southern California - S. Schroeter, D. Reed, J. Estes & D. Kushner

4:20 - Aspects of the ecology of white Abalone, *Haliotis soreneni* - D. V. Richards & P. L. Haaker

\* Indicates student competing for an award

5:00 - 7:00 - Poster Session/Wine & Cheese Reception, Commons Restaurant

**COASTAL HABITAT RESTORATION**

Organizer: Ralph Appy, Port of Los Angeles

Morning:

9:10 - Introduction - R. Appy

9:20 - Coastal wetlands restoration project planning - D. G. Cannon

9:40 - The use of numerical models in wetland planning and design - Y. K. Poon

10:00 - Lagoon tidal response to ocean level variation - S. Jenkins

10:20 - Flood tide delta formation, evolution, and influence within restored tidal wetland systems - K. W. Merkel

10:40 - BREAK

11:00 - PLENARY SESSION



Afternoon:

1:20 - The design and research plan of the model marsh in contributing to restoration ecology - J. M. Lessman, S. P., Madon & J. B. Zedler

1:40 - Habitat goals for San Francisco Bay and their practical application - M. Josselyn

2:00 - Cordgrass (*Spartina foliosa*) expansion onto intertidal mudflats at Tijuana Estuary - predictions from a simulation model and implications for restoration - K. M. Ward, D. H. Deutschman, J. C. Callaway & J. B. Zedler

2:20 - Integrating spatial and temporal variability into fish diet analyses provides a better understanding of the Tijuana Estuary food web - G. D. Williams, J. M. West, S. Madon & J. B. Zedler

2:40 - Value of coastal salt marsh habitats to growth of the California Killfish, *Fundulus parvipinnis*: a bioenergetics modeling evaluation - S. P. Madon, G. D. Williams, J. M. Wets & J. B. Zedler

3:00 - BREAK

3:20 - Value of shallow water habitat created in the outer Los Angeles Harbor - K. Green & R. G. Appy

3:40 - Relocation of a large Black Crowned Night Heron colony in southern California - S. Crouch

4:00 - Increase in the California Least Tern population at Los Angeles Harbor in response to newly-created dredge fill habitat - K. Keane

5:00 - 7:00 - Poster Session/Wine & Cheese Reception, Commons Restaurant

### TERRESTRIAL STUDIES: PHYSICAL SCIENCES

8:20 - \*Synthesis and photooxidation of gold (I) triphenylphosphine phenylthiolate - K. Lee & H. Symon

8:40 - \*Hepatocyte-specific mutation establishes RXR $\alpha$  as a heterodimeric integrator of multiple physiological processes in the liver - G. Enriquez & H. Sucov

9:00 - \*Mode of major histocompatibility complex evolution in the Greenbuls (Aves:Pycnonotidae) - A. Aquilar & R. K. Wayne

9:20 - Elephantoxene ciliated eucaryote microbes, the California observations - T. P. Smith, K. Jolie and J. L. Mohr

9:40 - \*Differences in vegetation and topography between areas of high and low California Knatcatcher densities - T. L. Mashikian

10:00 - \*A field investigation of the Clark Mountain fault complex, San Bernardino County, California - S. M. Baltzer & M. Waki

10:20 - Modern analogues for size clines in Anostid Trilobites - L. Ritterbush

\* Indicates students competing for an award

10:40 - BREAK

11:00 - 12:00 - PLENARY SESSION

**RESEARCH AT PUBLIC AQUARIUMS**

Organizers: Judy Lemus, USC Sea Grant Program & Susanne Miller, Cabrillo Marine Aquarium

Afternoon:

1:20 - KEY NOTE: Conservation activities of aquariums in North America - J. Nightingale

2:00 - Term population studies by Cabrillo Marine Aquarium - S. Lawrenz-Miller

2:20 - Preliminary notes on the captive spawning and rearing of *Stereolepsis gigas*, the Giant Sea Bass, at the Long Beach Aquarium of the Pacific - M. Ankley

2:40 - Coral spawning at the Birch Aquarium at Scripps - F. Nosratpour

3:00 - BREAK

3:20 - Growing young sea animals and young scientists at the Cabrillo Marine Aquarium - M. Schaadt

3:40 - Effective removal of carbon dioxide in an anchovy (*Engraulis mordax*) exhibit at the Aquarium of the Pacific - N. Lightowler Caruso

4:00 - The design and effectiveness of an algal scrubber on a temperate closed-system marine aquarium - S. E. Blair

4:20 - Monitoring the reproductive status of sea otters (*Enhydra lutris*) - S. E. Larson

4:40 - 5:00 - PANEL DISCUSSION

**FRIDAY EVENING, MAY 19, 2000****POSTER SESSION. WINE & CHEESE RECEPTION - COMMONS RESTAURANT**

5:00 - 7:00pm, MAY 19, 2000

Chair - Kathryn Dickson, California State University, Fullerton

P1 - Evidence of the 1997-1998 El Nino in a local ocean monitoring program - D. O'Donohue & A. Groce

P2 - Evidence of the 1997-1998 El Nino in the fish community off San Diego - R. Gartman & A. Groce

P3 - Changes in diet of terns and skimmers nesting at the Bolsa Chica Ecological Reserve in southern California: possible responses to climate change and shifts in prey populations - M. H. Horn & W. M. Dahdul

P4\* - Decline of species diversity and standing stock at Little Corona Del Mar's rocky intertidal, southern California - L. Shafer, P. Bennett, T. Anderson, D. Williams & D. Kelly

P5 - Diet preference hierarchy of the juvenile Sea Hare, *Aplysia californica* Cooper - L. Ranch

P6\* - Discovering old anew: unpublished museum material alters the "known" geographic range of

marine invertebrates - S. I. Lonhart & J. W. Tupen

P7 - Hydrogeology and hydrochemistry of the Animas Basin aquifer system, southwestern New Mexico - M. Lee, B. Hibbs & J. Hawley

P8\* - To mulch or not to mulch: a report on various methods of weed control on a restoration site - M. Lomeli, J. Albertazzi, J. Klass & J. Beedle

P9\* - Cutting costs: the effectiveness of revegetation on abandoned oil well sites in the Puente-Chino Hill Corridor - C. Profeta, J. Cabral & C. Swift

P10\* - Rates of growth and mortality on coastal live oaks, California Walnuts and Toyon - M. Rah, T. Wiater & C. Swift

P11\* - Endohelminths of White Croaker from the Los Angeles Harbor area, southern California - J. Peng & C. Hogue

P12\* - Macroparasites of Pacific Sanddab from polluted waters of the Palos VERdes shelf, California - J. Paris & C. Hogue

P13 - Age, growth and maturity of the longfin Sanddab (*Citharichthys xanhostigma*) off San Diego, California - A. Groce & C. Jenkins

P14\* - Meristic and morphological variation among California populations of the marine silverside fish, *Atherinops affinis* (Teleostei:Atherinopsidae) - K. M. O'Reill & M. H. Horn

P15\* - High creatine phosphokinase activity in the white muscle of the endothermic Mako shark - G. Lopez & K. A. Dickson

P16 - Heretofore undocumented variation of the intrinsic hand musculature in a juvenile baboon - K. C. Noriega

P17\* - Association study of the B3-adrenergic receptor polymorphism with risk factors for colon cancer - D. H. Nguyen, R. C. Bada, R. W. Haile, H. D. Frankl, E. R. Lee & S. A. Ingles

P18\* - Preliminary observations on marine mammals in the Santa Monica Bay, California - M. Bearzi & B. Stinmetz

P19\* - Genetic variation in the eastern Pacific Bay Pipefish, *Syngnathus leptorhynchus* (Gasterosteiformes: Syngnathidae) - K. D. Louie, K. P. Koepfli & D. K. Jacobs

P20 - Intraspecific phylogeography of *Atherinops affinis* (Teleostei:Atherinopsidae) from California waters using sequences of the mtDNA control and nuclear ITS-1 regions - J. W. Cavanagh & M. H. Horn

P21\* - Genetic variation in vernal pool crustaceans - E. Bomcamp & D. Eernisse

P22 - Water quality in the San Gabriel River, Los Angeles, California - J.G. Hering, M.P. Bachmann, D.E. Giammar, A.M. Hyldahl, Y.P. Liu, & T.M. Salmassi

P23 - Herbarium Databases: creation and maintenance - R. Schramm

P24 - Locally rare plants of Ventura County - D. L. Magney

P25- Ventura County vascular plant species of local concern -David Magney

**DISPLAY - Work of the Guild of Natural Science Illustrators, Southern California Chapter**

**\* - Undergraduate and graduate student authors - eligible for awards consideration**

## **SATURDAY, MAY 20, 2000**

11:00 - 12:00 - **PLENARY SESSON** - Dorothy Green, Founding President, Heal the Bay and who now serves as President of the Los Angeles & San Gabriel Rivers Watershed Council -

### **SYMPOSIA AND SESSIONS:**

Morning:

#### **THE LOS ANGELES RIVER: DISCHARGES, FATES, AND EFFECTS**

Organizer: Tina Hartney, Occidental College

8:15 - Introductory Remarks - T. Hartney

8:20 - Stormwater monitoring under the Los Angeles County NPDES Municipal Stormwater Permit - B. DePoto

8:40 - Some sources of bacterial inputs into the Los Angeles River from downtown Los Angeles, California - J. H. Dorsey, M. E. Mullin & T. Tram

9:00 - Title to be announced - R. Collins

9:20 - Impacts of the Los Angeles and San Gabriel Rivers on the coastal ocean - observations from a La Nina year 1998-1999 - B. H. Jones, A. Steele, M. Mengel & J. Shisko

9:40 - Citizen water quality monitoring in the Los Angeles River watershed - D. E. Gregorio

10:00 - Occurrence of *Heterosigma akashiwo* in San Pedro Bay, California, USA - D. E. Gregorio & L. Connell

10:20 - FoLAR Riverwatch: addressing watershed issues in the new millenium - J. V. Greenwood

10:40 - BREAK

11:00 - 12:00 PLENARY SSSION

Afternoon:

#### **ECOLOGY OF SOUTHERN CALIFORNIA RIPARIAN SYSTEMS AND POTENTIAL FOR ECOLOGICAL RESTORATION OF THE LOS ANGELES RIVER**

Organizers: Elizabeth Braker, Occidental College, Cheryl Swift, Whittier College

1:30 - Introduction and Welcome - E. Braker & C. Swift

1:40 - Determinants of plant community structure in southern California riparian habitats - D. S. Cooper

2:00 - Breeding bird species as indicators of riparian ecosystem health in urban Los Angeles: a local and regional perspective - D. S. Cooper

2:20 - Freshwater fishes of the Los Angeles River, Southern California - Camm Swift & D. C. Holland

2:40 - Hydrologic constraints on urban river restoration - K. D. Stolzenbach

3:00 BREAK

3:20 - Regional restoration goals for wetland resources in the greater Los Angeles drainage area - C. Rairdan

3:40 - Wetlands of the Los Angeles River watershed: profiles and restoration opportunities - S. Woods & C. Kroll

4:00 - Arroyo Seco restoration project - M. J. Zander

4:20 - Watershed planning at the urban/woldland interface: a case study of Arroyo Seco - T. Brink

4:40 - Panel Discussion - E. Braker & C. Swift, Moderators

### **NEW AND RARE FISH AND INVERTEBRATE SPECIES TO CALIFORNIA DURING THE 1997-1998 El Nino**

Organizers: M. James Allen, Southern California Coastal Water Research Project & Daniel J. Pondella, Vantuna Research Group, Occidental College

Morning:

9:00 - New and unusual invertebrates discovered at the California Channel Islands during the 1997-1998 El Nino - J. M. Engle & D. V. Richards

9:20 - Northern range extensions in into the southern California Bight of ten decapod crustacea related to the 1991/92 and 1997/98 El Nino events - D. E. Montagne & D. B. Cadien

9:40 - \*Multiple mechanisms alter the geographic range of marine coastal invertebrates - S. I. Lonhart & J. W. Tupen

10:00 - Shifts in fish and invertebrate assemblages of two southern California estuaries during the 1997-1998 ENSO - J. M. West, G. D. Williams & J. B. Zedler

10:20 - Fish population fluctuations 1996-2000 in lagoons on Marine Corps Camp Pendleton - Camm Swift & D. C. Holland

\* Indicates student competing for an award

10:40 - BREAK

11:00 - 12:00 - PLENARY SESSION

Afternoon:

1:20 - Records of Mexican Barracuda (*Sphyraena ensis*) in southern California with notes on scalloped Hammerhead (*Sphyrna lewin*) and Pacific Sierra (*Scomberomorus sierra*) - M. Shane

1:40 - Notes on the addition of the Pacific Cornetfish (*Fistularia corneta*) to the southern California Bight fauna and related notes on other rare fish and invertebrates observed during the 1997-1998 El Nino (with some earlier unreported collections) - M. D. Curtis, R. H. Moore, D. G. Vilas & K. T. Herbinson

2:00 - The addition of a Lizardfish (*Synodontidae*) and a Dragonet (*Callionymidae*) to the California ichthyofauna - A. K. Groce & M. J. Allen

2:20 - Addition of Blackspot Wrasse (*Decodon melasma*) and Speckledtail Flounder (*Engyophrys sanctilaurentii*) to the California fauna - M. J. Allen and A. K. Groce

2:40 - First sighting and rare occurrence of three subtropical fishes in southern California - M. T. Craig & D. J. Pondella

3:00 - BREAK

3:20 - New and unusual reef fish discovered at the California Channel Islands during the 1997-1998 El Nino - D. V. Richards & J. M. Engle

3:40 - Distributional notes on the fishes of Fieberling Guyot, with a description of a new species of *Nezumia* (Gadiformes: Macrouridae) - R. R. Wilson Jr

4:00 - 5:00 - Discussion

5:00 - 6:00 - Southern California Academy of Sciences Business Meeting

## LICHEN SYMPOSIUM

Morning:

Organizer: David Mangey, David Magney Environmental Consulting & California Native Plant Society, P.O. Box 1346, Ojai, CA 93924-1346

9:00 - Introduction, D. Mangey

9:20 - Lichens of the California Channel Islands - Charis Bratt

9:40 - Conservation of California Lichens - D. Mangey

10:00 - Variation in thallus morphology, chemistry, exciple anatomy and spore ultrastructure of the Saxicolous lichens treated within the *Buellia retrovertens* group - F. Bungartz

10:20 - Calleguas Creek watershed wetlands rerotation planning - D. Mangey

10:40 - Break

11:00 - 12:00 - PLENARY SESSION

## CONTRIBUTED SESSIONS

Contributed Sessions Chair: John Roberts, California State University, Dominguez Hills

Morning:

**FISH: ANATOMY, PHYSIOLOGY AND EVOLUTION**

9:00 - \*Comparative morphology and histology of the digestive tract of the Teleost Family *Trichomycteridae*: the parasitic catfishes - D. M. Morales & J. N. Baskin

9:20 - Phylogeographic relationships of the sandbasses of the genus *Paralabrax* (Serranidae, Perciformes) - G. A. Herrera

9:40 - \*Lactate concentrations in white, red and heart muscle in terrestrial California grunion (*Leuresthes tenuis*) - J. E. Draiss, H. Lakisic, R. C. Van Winkle & K. L. Martin

10:00 - \*Use of a synthetic polypeptide to determine the sex and reproductive status of field-caught red grouper, *Epinephelus morio* - J. L. Jarrell & R. R. Wilson

\* Indicates students competing for an award

10:20 - BREAK

11:00 - 12:00 - PLENARY SESSION

Afternoon:

**MARINE AND COASTAL ECOLOGY: WATER QUALITY**

1:20 - Examining the relationship between public perceptions and environmental quality: a survey study of beach use and perceptions in Los Angeles County - L. H. Pendleton, N. Martin & D. G. Webster

1:40 - Composition and distribution of beach debris in Orange County, California - S. L. Moore, D. Gregorio, M. Carreon, S. B. Weisberg & M. K. Leecaster

2:00 - Efficiency and accuracy of stormwater mass emission monitoring programs in southern California - L. Tiefenthaler, K. Schiff & M. Leecaster

2:20 - Using the sediment quality triad approach in sediment quality monitoring near southern California municipal wastewater outfall - J. L. Armstrong, M. E. McCarthy, K. A. Sakamoto and C. M. Thomas

2:40 - \*Nitrate contamination of surface water and shallow ground water in the Irvine Basin, Orange County, California - J. Walker, B. Hibbs & M. Lee

3:00 - BREAK

3:20 - \*Energy allocation and postnatal growth in fish-eating seabirds: feeding trials with captive Elegant Tern chicks raised on high vs. low energy diets - W. M. Dahdul & M. H. Horn

3:40 - \*Trophic position of southern California estuarine and island populations of the silverside fish *Atherinops affinis* (Teleostei:Atherinopsidae): analyses of <sup>15</sup>N and <sup>13</sup>C stable isotopes and dietary items - D. Smith & M. Horn

4:00 - \*Microsatellite diversity in the mesopelagic shrimp, *Acanthephyra curtirostris* (Caridae:Oplophoridae) - J. R. Scarbrough, J. F. Sands, D. L. Cowles & R. L. Carter

4:20 - Biodiversity and distribution of peracarid crustacean assemblages off San Diego, southern California - T. D. Stebbins

4:40 - \*Temperature effects on feeding ecology of three seaweed-eating species of *Tegula* (Trichidae:Gastropoda) from central and southern California - E. Yee & S. Murray

\* Indicates students competing for an award

5:00 - 6:00pm - Southern California Academy of Sciences Business Meeting - Stauffer Lecture Hall 100