

The Southern California Coastal Water Research Project — 30 years of environmental research in the Southern California Bight

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PREFACE

“An hypothesis is always more believable than the truth, for it has been tailored to resemble our ideas of truth whereas the truth is just its own clumsy self. Ergo, never discover the truth when an hypothesis will do.”

Nicoli Machiavelli as quoted by Professor John D. Isaacs, Chair, SCCWRP Scientific Consulting Board, 1969-1980, in testimony before the U.S. Congress, 1978 (Isaacs 1978).

This tongue-in-cheek usage of a Renaissance quote, scrawled across the blackboard of a smoke-filled conference room, challenged the young staff of the Southern California Coastal Water Research Project (SCCWRP) as they nervously assembled for yet another wrenching review of their work by SCCWRP’s first Scientific Consulting Board. Every four or five months during the early 1970s, Directors George Hlavka, and then Willard Bascom, called together five internationally recognized senior scientists. They would spend the long weekend drilling, chiding, challenging, and, eventually, commending the SCCWRP staff of young oceanographers, biologists,

geochemists, and bright administrative and support personnel. Often present were staff from the sponsoring agencies as well as scientists from the National Oceanic and Atmospheric Administration’s (NOAA’s) New York Bight and Puget Sound Marine EcoSystem Analysis Programs (MESA); representatives of the Environmental Protection Agency’s (EPA) Regional Office Director (San Francisco); and staff of the EPA’s Research and Development Program in Corvallis, Oregon. In those days, stealing good ideas was a form of flattery.

This setting is an early part of the consciousness of a unique organization that as yet has no parallel in the United States or abroad — the Southern California Coastal Water Research Project. Since its inception in 1969, approximately 200 scientists, technicians, and administrative personnel have passed through the portals of SCCWRP (see below); most have moved on to other agencies and locations in California and the U.S., taking with them, and continuing, the excitement, challenges, team-manship, myth-breaking philosophy, and camaraderie that began so many years ago in a place that continues to this day to strive for superiority as a major marine environmental research and assessment center. Fortunately, a few original staff remain on-scene, or nearby, providing valuable experience and sharing in new discoveries.

To mark a major milestone in the publication of the SCCWRP 2000 Annual Report, this article is a joint effort by former and current SCCWRP scientists to create a sense of history and describe the accomplishments made by past and current scientists, administrators, and directors employed by SCCWRP over the past 30 years. The goal of this article is to provide historical facts presented in the context of past and continuing

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missions of SCCWRP, and to emphasize the vitally important role of a long-term, coordinated scientific role and perspective in environmental management. Above all, SCCWRP has always been defined by, and will continue to be defined by, controversy, challenge, and vision. It is after all controversy and challenge that sharpens our vision and continues to improve the world around us.

Our attempt is necessarily limited by the constraints imposed by the passing of time. Fortunately, much of the history of SCCWRP is recorded in various pages of 19 Annual and Biennial Reports and several dozen newsletters. We collected and reviewed, to the extent possible, relevant information about the governing bodies, funding sources, directors, staff, locations, and scientific activities that make up the parts of the whole that SCCWRP is today. However, some relevant information - most notably data on some revenues and their sources and the tenures of some commissioners and staff - could not be located despite extensive fact-finding efforts. We reserve those missing pieces for some future effort.

To put the facts and figures that were available in a larger context, the authors discussed and reflected upon SCCWRP's accomplishments over the years and also attempted to look at the history of SCCWRP from the perspective of changing local and national settings - environmental, policy, public opinion, and science. Challenging dogma, practicing forward-thinking science in the face of criticism, and working in cooperative associations with regional stakeholders have been key elements of SCCWRP's history, unique character, and longevity. This review addresses these points and cites national documents and papers that are not part of the SCCWRP literature per se but which reflect directly on SCCWRP's research and motivations. The serious student of SCCWRP and the SCCWRP sponsor will want to use these documents as starting points for additional research. It is this context that puts the facts and figures into a unique yet dynamic perspective.

WHAT IS SCCWRP?

SCCWRP is a regional government agency whose charter is the conduct of environmental research with a goal to increase the understanding of the effects of human activities on the ecology of coastal waters of the Southern California Bight. SCCWRP was founded in 1969, when five local government agencies (the Cities of San Diego and Los Angeles, the County Sanitation Districts of Los Angeles and Orange Counties, and Ventura County) entered into a joint powers agreement to sponsor environmental research in southern California's coastal waters (Parkhurst 1969, Hlavka 1972). The purpose of this agreement was to create a public agency, separate from these sponsoring agencies, that would increase the scientific knowledge of the marine ecological systems of southern California and their interrelationships with treated wastewater discharges, to insure enhancement of the marine environment (modified slightly from *Joint Powers Agreement Creating an Agency To Be Known as the Southern California Coastal Water Research Project Authority*, 1969). By 2001, SCCWRP's charter had expanded to include increasing the scientific knowledge of the interrelationships of treated wastewater and other water discharges, and other inputs with aquatic ecological systems in southern California coastal waters, thereby insuring protection and conservation of these resources (modified slightly from the *Fifth Amended Joint Powers Agreement Confirming the Creation of an Agency Known as the Southern California Coastal Water Research Project Authority*, 2001). The founders envisioned that their own established monitoring and research programs, largely focused around discharge permit requirements, could benefit from the addition of a project with regionwide focus.

Present Mission

In 1995 the Commission, the Commission's Technical Advisory Group, and SCCWRP staff worked together to redefine a mission statement to provide focus for SCCWRP's future direction. SCCWRP's mission is to contribute to the scientific understanding of linkages among human activities, natural events, and the health of the southern California coastal environment, communicate this understanding to decision-makers and other stakeholders, and recommend strategies for protecting the ocean environment for this and future generations. In 1995, SCCWRP adopted six strategic goals for achieving this mission:

- (1) To develop, participate in, and coordinate programs to understand ecological systems in the coastal waters, and to document relationships between these systems and human activities;
- (2) To answer questions regarding the southern California coastal waters: Is it safe to swim? Is it safe to eat the fish? Is the ecosystem healthy? Are the resources being protected?
- (3) To effectively communicate our research findings and recommendations, through a variety of media, to decision-makers and other stakeholders;
- (4) To continuously examine the composition and structure of SCCWRP to enhance the ability of the organization in achieving its mission;
- (5) To serve as a catalyst in forming partnerships and alliances which further these goals;
- (6) To provide an information management system to archive, retrieve, analyze, and display SCCWRP data to achieve the above goals and enhance our understanding of the Southern California Bight.

THE SCCWRP VISION: HOW IT STARTED

To understand the vision that brought SCCWRP into existence, and what has kept it going, it is necessary to understand the development and environmental history of coastal southern California.

Development of the Coastal Basin

Only 100 years ago, southern California was a vast open coastal plain dotted with villages and towns, widely separated by fields, farms and orchards—all surrounding the fast-growing city centers of Los Angeles, Long Beach, San Pedro, and San Diego. The economy was shifting from agriculture to industry and commerce. Oil derricks were beginning to dot the countryside and water was flowing through the basin from the Sierra Nevada Mountains and the Colorado River. Politicians and water engineers, flood control engineers, and wastewater engineers who envisioned a basin full of people and commerce banded together and created large joint water and sanitation agencies.

Emplacement of trunk lines and interceptors, as well as the rerouting of riverbeds, led to a road map for development of the coastal cities (Rawn 1965).

Wastewater trunk lines found their way to the ocean. The selection of coastal sewage discharge locations was motivated by a determination to keep sewage away from the public shorelines. Deep water and rocky shores, such as at Palos Verdes and Point Loma, California, were considered remote, inaccessible, and suitable for dilution of the wastewater (Rawn 1965).

Movies, World War II, and television brought southern California to the world, creating the anticipation that could fuel colonization and development. The regional wastewater treatment systems (as opposed to scattered separate systems) proved their worth, collecting and transporting the wastes and debris of a new and rapidly expanding society out to the coast.

Signs of Problems Ahead

A number of significant regional environmental events — some natural and others presumably man-made —

foreshadowed the problems and challenges that lay ahead. Although normally an area with low runoff, the southern California coastal area has occasionally been subject to devastating floods, such as those that occurred in the 1860s and 1880s (Kuhn and Shepard 1981) and several periods thereafter. During the floods of the 1930s, the Santa Ana River was five miles wide at Huntington Beach. Flood control districts responded by building the massive concrete structures that line the river beds crisscrossing the basin today. During the same time period, many smaller streams were drying up as the result of diversions and groundwater depletion while large freshwater riparian areas and estuarine coastal marshes were being leveled for agriculture or channelized to create marinas that dot the coast today. In San Pedro, especially, the great port of Los Angeles and Long Beach was carved out by dredging and filling extensive wetlands, converting former rich biological nurseries into a world-class shipping and commerce center. Earthquakes challenged new towns and prompted the building of new infrastructure. War, followed by enhanced commerce and the settlement of outlying areas, rearranged the demographics of San Diego Bay and areas from San Pedro to Huntington Beach. Great interstate highway systems were built, crisscrossing the basin and marking a line of heavy traffic along the entire coastline.

A simple visual image of the magnitude of these changes can be seen on the Los Angeles County flag hanging in the chambers of the Los Angeles County Board of Supervisors, which depicts a school of fish and a fertile agricultural field alongside quadrates of industry and housing. The juxtaposition of nature and industry symbolizes a battle for the environment that would be mounted in California over the coming years. The Port of Los Angeles received the State's largest fishery landings and supported a half-dozen canneries until 1960. Oil refineries, drilling rigs, and shipbuilding/repair facilities added to a major flow of pollutants discharging into the semi-enclosed harbor waters. The port became a major focus for cleanup and regulatory pressures in the 1960s. The initial response to these changes in both San Diego and Los Angeles was diversion through longer, more modern ocean outfalls to the open ocean shelf.

Marine pollution became an issue in the 1920s and 1930s, when California Department of Fish and Game wardens and the public became incensed over numerous oil spills (reviewed in Mearns *et al.* 1991). In the 1950s Professor Don Reish (California State University, Long Beach) began reporting on the impacts of poor water quality on marine life of Los Angeles-Long Beach Harbor (reviewed in Reish 1972) and adjacent areas. In the 1960s, the Regional Water Quality Control Board, Los Angeles

Region, began to more vigorously enforce regulations in Los Angeles/Long Beach Harbor. During the late 1950s through the 1960s, the State Water Resources Control Board commissioned staff of the Allan Hancock Foundation at USC to conduct region wide ecological surveys of the coastal shelf (USC, AHF 1959). Meanwhile, Dr. Wheeler North (Scripps Institution of Oceanography and, later, California Institute of Technology) was documenting the decline of kelp beds off Palos Verdes and other rocky coasts. The Southern California Edison Company began building the first coastal nuclear electrical generating station at San Onofre, and expanding fossil fuel plant capacity elsewhere, all engendering environmental concern. Scientists at Scripps Institution of Oceanography and also in Oregon and Washington described rising concentrations of radioactive metals in coastal mussels, coming both from atom bomb testing in the Pacific and from discharges from the Columbia River. Several huge "red tides" pummeled the coast. Elsewhere, pronouncements from Minimata Bay, Japan, raised the specter of mercury poisoning. The coast, it seemed, was being attacked by land, by air, and by sea.

Less heralded, but of great importance to fisheries, was the demise of the Pacific sardine (*Sardinops sagax*) populations in the late 1940s and early 1950s, and then the great and long-lasting El Niño of 1957-1959, an event that served to put local marine and fishery scientists on final notice that the Pacific Ocean could undertake great changes that had the potential to wipe out the entire regional fishery ecosystem (Sette and Isaacs 1960). From these events evolved, in the late 1940s, the unprecedented California Cooperative Oceanic Fisheries Investigations (CalCOFI) program, which in many ways served as a stimulus and vision for SCCWRP.

All Hell Breaks Loose

On Tuesday morning, January 28, 1969, Well A-21 on Platform A in the Santa Barbara Channel blew out, initiating the largest single oil spill in California and U.S. history. During the next four months, thousands upon thousands of tons of crude oil spread 100 miles along the coast, becoming not only the "Mother of All Spills" in the U.S., but also the first national media event of its kind and a rallying point for the U.S. environmental movement (Dye 1971). While other spills have occurred in California, none has been as commanding as the Santa Barbara oil spill. By coincidence, SCCWRP's future second Director, Willard Bascom, was among the key response personnel and filmed the unfolding event.

During the same year, biologists were puzzled over the rapid decline of brown pelican (*Pelecanus occidentalis*) colonies on Anacapa Island. High concentrations of the

pesticide DDT were discovered in their eggs and high concentrations were found in nearshore fish (Risebrough *et al.* 1971). The prediction Rachel Carson made in the movie *Silent Spring* seemed to be coming true—the life-saving pesticides of the 1940s and 1950s were about to wreak havoc on the oceans as well as the land. A little-known but common chemical called “PCB” was discovered in fish. Finally, during 1969, biologists reported to the media and state legislatures the occurrence of tumor-bearing fishes around outfalls and in polluted harbors, bringing public focus on the question of cancer and carcinogens in the marine environment. The survival, health, and future of the marine environment was openly debated. Finger-pointing had become the rage.

Clean Water Act: The Technology Solution

Prior to the late 1960s, coastal water quality issues were either not of great concern or were handled on a case-by-case, water-quality issue, basis. Federal law affecting water pollution in the United States began with the Refuse Act (1899), which focused primarily on the protection of navigation rather than on the quality of the nation’s waters. In the late 1960s, federal regulators began to use the language of the Refuse Act to establish an environmentally oriented program to control water pollution. All that changed with events leading up to enactment of the Clean Water Act (CWA) in 1972, which formalized a shift from water quality-based to effluent quality-based enforcement criteria (NRC 1993).

The 1972 CWA required that the EPA set national effluent standards, referred to as “effluent limitation guidelines” or “effluent guidelines.” The Act’s stated objective is to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” To achieve this, the Act established the following goals:

- Elimination of the discharge of pollutants into waters of the United States; and
- Achievement of a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and for recreation in and on the water.

The Act provided that more stringent pollution controls could be imposed where technology-based limitations were insufficient to ensure that the quality of receiving waters did not deteriorate to, or remain at, unacceptable levels. It also established the National Pollution Discharge Elimination System (NPDES) permit program, which could be administered by states after federal authorization. The states were required to write general guidelines, standards, and criteria for all waters, including inland, bay and estuarine, and ocean. These guidelines were revised every three years or as necessary to reflect the scientific community’s continuing

knowledge and understanding of “pollution” and processes affecting human health and the environment. The effluent guidelines, water quality requirements, and permit program set forth by the NPDES—with all of its provisions—remains in place today. All dischargers were required to meet specific effluent quality criteria and implement the best available treatment, regardless of receiving water quality.

A Regional Independent Marine Research Authority

The idea of a regional marine research authority was already underway when the events of 1969 unfolded and while the Clean Water Act was being envisioned. We are not historical experts and must leave it to others to determine to what extent these events led to or contributed to the founding of SCCWRP. However, we cannot conceive that they were ignored by the founders.

The concept of a regional authority was for marine research conceived by the leaders of the five major metropolitan sanitation agencies in the late 1960s. While on a joint retreat, and with counsel of government and university scientists (with Dr. Erman A. Pearson, a professor of environmental engineering at the University of California, Berkeley, who played a particularly significant role), began discussions about the concept of pooling resources to fund an independent, regional coastal marine environmental organization. Nothing like this, with motivation from ocean stakeholders, had been done before in the U.S. The founders were presumably motivated by the growing concern that wastewater treatment decisions would be made based upon little or no scientific fact, responding to the outcry of the public who were outraged by all the events leading up to this period of time (Parkhurst 1969). John D. Parkhurst, Chief Engineer and General Manager of the County Sanitation Districts of Los Angeles County, asked Charles Carry (who later became a SCCWRP commissioner) to draft a plan for such an organization. By mid-1969, agreements were reached and the SCCWRP Authority became a “special district “ of the State of California.

In late 1969, Dr. George Hlavka, an engineer, was chosen as the first Director. He located the first office in Westwood, hired biologist Marjorie Sherwood as the first secretary, and brought aboard a small staff of recently graduated scientists and the first SCCWRP Consulting Board. Dr. Hlavka’s charge was simple and direct: develop an understanding of the ecology of the Southern California Bight and make recommendations for wastewater management - all within a deadline of three years (Hlavka 1972). The initial objectives of this project were (1) to collate and evaluate available data on the ecology and marine waste disposal practices of the area, (2) to collect supplemental

field data, and (3) to present findings, conclusions, and recommendations to wastewater management officials. This initial objective was accomplished with the production of “Ecology of the Southern California Bight: Implications for water quality management” (SCCWRP 1973). Obviously, three years was not enough. The sponsoring agencies have gone well beyond the original calling and have sponsored SCCWRP for 10 times three years. SCCWRP has survived and prospered by keeping up with the times, not only in terms of science but also in terms of governance and structure, as outlined below.



Dr. Erman A. Pearson
Professor of Environmental Engineering
University of California, Berkeley



John D. Parkhurst
Chief Engineer and General Manager
County Sanitation Districts of Los
Angeles County



Charles Carry
Chief Engineer and General Manager
County Sanitation Districts of Los
Angeles County

HOW SCCWRP WORKS

The general governance of SCCWRP has been consistent over the years in terms of basic structure and oversight. Important components include a public (until 1990) Commission and scientific consulting board and/or technical advisory group. The specific nature of these bodies has changed somewhat over time.

Joint Powers Agreement

As noted above, the SCCWRP Authority was initiated in the summer of 1969 under a three-year Joint Powers Agreement (JPA) among the five original sponsors. The agreement specified the sponsors, mission, and objectives, as well as the composition of a Board of Commissioners and scientific Consulting Board. This agreement has been amended 14 times, with four amended JPAs (Table 1). The original JPA was amended twice, in 1972 and 1975, to extend the project three and five years, respectively. The Amended JPA (different from the amendment to the Amended JPA of 1972) was signed in 1979. This JPA made provisions for new public agencies to join the Authority and extended the project to 1982. The Amended JPA was amended six times, with amendments in 1982 (first amendment) and 1985 (second amendment) extending the term for three years and in 1988 (fifth amendment) and 1989 (sixth amendment) for one year. The Second Amended JPA of 1990 was the most significant of the four amended JPAs, adding five regulatory agencies (U.S. Environmental Protection Agency, Region IX; State Water Resources Control Board; Regional Water Quality Control Board, Los Angeles Region; Regional Water Quality Control Board, Santa Ana Region; and Regional Water Quality Control Board, San Diego Region) to the SCCWRP Commission, bringing its membership to nine. Unlike the existing four agencies, these agencies did not provide direct funding. The Second Amended JPA was amended in 1991, extending SCCWRP for three years. The Third Amended JPA of 1994 provided for an executive director, disbanded a specific Scientific Consulting Board (although allowing for advisory boards to be appointed as needed), and extended the charter of SCCWRP for three years. The Fourth Amended JPA detailed a specific signatory funding schedule, declining for each of the subsequent four years, and extended SCCWRP to 2001.

Since its inception in 1969, sponsoring wastewater agencies have provided primary funding to support a unique approach to understanding the coastal environment and human impacts. The most recent JPA fundamentally changes this arrangement and relies on SCCWRP’s previous track record to successfully compete with other public/private research organizations. The implications and ramifi-

TABLE 1. Southern California Coastal Water Research Project Commissioners and Joint Power Agreement periods, 1969-2000.

Agency	Year 1969-1999																																		
	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00			
JPA PERIODS*	Original										Amended										2nd Amended					3rd Amen.					4th Amen.				
	O		O1		O2						A		A1		A2							A5	A6	2A	2A1		3A				4A				
	to 2001																																		
COMMISSION																																			
City, Los Angeles	Timberlake					Janet B Barhydt *					Janet B (Barhydt) Garber					Delwin A Biagi					S J Wilson														
Los Angeles	William S Peterson					John E Zoeger					R Alpern					IC M Miller					I S Cheng														
CSDOC	Lindsley Parsons					James B Sharp					Richard B Edgar					J W Sylvester					Blake Anderson					Ghirelli									
	Clifton C. Miller					Duke MC J Sharp					Parsons D Fox					Griffin James E Neal					Blake Anderson					T N N Wheatley					Moore				
City, San Diego	H Cobb					Bob Martinet					M O'Connor					Roy E. Dodson					R King J Frautschy					ACL M Mills					Alan C Langworthy				
	B Martinet					M O'Connor					B Martinet					Joseph F Dietz																			
CSDLAC	Bert Bond					Wallace W Edgerton					Charles W. Carry																								
	T D'Arcy Quinn										Robert P Miele					RH																			
Ventura Co./ V Co. District	T Laubacher					F Jewett					Donald H Miller					Maland Melton					L H Maland														
	H Robinson					J J K Flynn					Jewett Maland					Eaton Wright					J K Flynn														
City, Oxnard																Ann Johs																			
																DM T P Nanson																			
RWQCB,LAR																Robert P Ghirelli					D Dickerson														
																H Catherine Tyrrell					Smith														
RWQCB,SAR																Gerald J. Thibeault																			
																Gordon K Anderson					Mayville														
RWQCB,SDR																Arthur L Coe					JR Arthur L Coe														
																Bruce W Posthumus					AC J. Robertus														
SWRCB																EA JD Pettit					Jesse M Diaz					SM									
																JB Cohen					JD KW Martinson														
US EPA, Region IX																LB Seraydarian																			
																					Janet Y Hashimoto														

* Only Joint Power Agreement, Amended Joint Power Agreements, and Amendments to these that extended SCCWRP term are shown. Third Amendment to Amended JPA and Equipment Agreement (both of 1986), Fourth Amendment to Amended JPA (of 1988), and Amendment to Fourth Amended JPA (also in 1997) are not shown because these did not extend SCCWRP term.

Abbreviations: A = Alternate Commissioner; C = Commissioner; Co. = County; CSD = County Sanitation Districts (LAC = Los Angeles County, OC = Orange County); EPA = Environmental Protection Agency; JPA = Joint Powers Agreement; RWQCB = Regional Water Quality Control Board (LAR = Los Angeles Region, SAR = Santa Ana Region, SDR = San Diego Region); SWRCB = State Water Resources Control Board. Ventura C/V Co District = Ventura County (1969-1975), Ventura Regional County Sanitation District (1975-1986)

Name Abbreviations: AC = A. L. Coe; ACL = A. C. Langworthy; Cohen = D. Cohen; DM = D. Maron; Duke = H. Duke; EA = E. Anton; Eaton = D. Eaton; Ghirelli = R. P. Ghirelli; Griffin = D. R. Griffin; H = R. A. Harris; IC = I. Samuel Cheng; J = F. Jewett; JB = J. Bennett; JD = J. M. Diaz; Jewett = F. Jewett; JR = J. Robertus; KW = K. Wasserman; LB = L. Barsamian; Maland = L. H. Maland; MC = M. J. Callahan; Martinson = S. Martinson; Mayville = S. Mayville; Melton = J. Melton; Moore = M. D. Moore; N = M. Nellor; Parsons = L. Parsons; Pettit = W. Pettit; RH = R. W. Horvath; S = Drew Sones; Seraydarian = H. Seraydarian; SM = S. Martinson; Smith = D. Smith; T = E. Torres; Timberlake = L. E. Timberlake; Wright = D. Wright.

cations of this change on research as opposed to public projects have yet to be fully explored (see FUNDING).

Sponsoring (Signatory) Agencies

Four agencies (the cities of Los Angeles and San Diego and the County Sanitation Districts of Los Angeles and Orange counties) have been sponsors continuously throughout SCCWRP's 30 years, while four other agencies have been sponsors or associate sponsors for a portion of that period. Early active sponsors were Ventura County/Ventura County Sanitation District (1969-1975), Ventura Regional Sanitation District (1975-1986), and City of Oxnard (1986-1990). Associate sponsors (without membership on the Commission) were Encina Wastewater Authority (1983-1989), Southeast Regional Reclamation Authority (1983-1990), and Aliso Water Management Agency (1989-1990).

The financial support from these agencies has been supplemented by contracts and grants, primarily from Federal (e.g., the U.S. Environmental Protection Agency [U.S. EPA] and the National Oceanic and Atmospheric Administration [NOAA]), state (e.g., the California State Water Resources Control Board); and local government agencies, resulting in additional services.

Commission

SCCWRP is governed by a Commission composed of public representatives of its sponsoring agencies, with terms and duties defined by the JPA and its amendments (Table 1, Appendix 1). Initially, these members were local civic leaders and elected officials who were appointed to the SCCWRP Commission to reflect public attitudes toward environmental quality (Clark and Moulder 1976). In 1982

an amendment to the Amended JPA provided for a program review committee consisting of the highest official in each of the sponsoring agencies (similar to the existing Commission). In the 1990 and the subsequent amended JPAs, the position occupied by each commissioner within his or her respective agency was specifically defined.

During the first 21 years, the five-member Commission consisted of representatives of the five signatory agencies (County Sanitation Districts of Los Angeles; County Sanitation Districts of Orange Counties; City of Los Angeles; City of San Diego; and either Ventura County, Ventura Regional County Sanitation District, or City of Oxnard). In 1990 representatives of a federal agency and four state agencies were added to the Commission. This nine-member Commission was composed of representatives from the County Sanitation Districts of Los Angeles and Orange counties; the Cities of Los Angeles and San Diego; the California Regional Water Quality Control Boards (Los Angeles, Santa Ana, and San Diego regions), the California State Water Resources Control Board, and the U.S. Environmental Protection Agency, Region IX (Table 1). SCCWRP is currently governed jointly by regulators and dischargers, resulting in a uniquely structured organization that has the autonomy and authority to address issues of greatest concern to the public.

Since 1969, 74 persons have served as commissioners and/or alternate commissioners, with 39 persons serving as primary commissioners (Table 1, Appendix 1). Janet B. (Barhydt) Garber (City of Los Angeles) served longest as commissioner (18 years, 1972-1990), although an alternate commissioner, T. Darcy Quinn (CSDLAC), served longer (21 years, 1969-1990). SCCWRP has matured to the point that one commissioner (Robert P. Ghirelli) has represented two different agencies (RWQCB/LAR and OCSD). Michael D. Moore (an alternate commissioner from OCSD) is the first and only member of the SCCWRP staff to leave the organization and return as a Commission representative from a member agency.

Scientific Consulting Board

In addition to a Commission of public and civic officials representing public attitudes, SCCWRP received oversight from 1969 to 1994 from a Scientific Consulting Board, consisting of five (at any one time) distinguished scientists from academic institutions and government agencies. These eminent scientists had no connection to any of the sponsoring agencies and provided scientific guidance and additional credibility to the research conducted by the project (Garber 1986). From 1969 to 1990, the JPAs defined five areas of expertise for this board: Marine Biology, Oceanography, Environmental Engineering, Organic Chemistry, and Public

Health. In 1990, these were modified to include Fisheries, Oceanography, Benthic Ecology, Marine Chemistry, and Toxicology. Since only five consulting board positions were defined, a new member was not added until an existing member retired. Often a new member provided new or specialized expertise that was different from his or her predecessor, with the expertise of a given lineage varying somewhat over time.

From 1969 to 1994, 30 scientists served on the Scientific Consulting Board (Table 2, Appendix 2). Professor John D. Isaacs (Scripps Institution of Oceanography), who chaired this board from 1969 to 1980, served the longest time as a consulting board member and, along with Dr. Erman Pearson (University of California, Berkeley) was particularly influential in the success of SCCWRP's projects during the formative years. After John Isaacs' death, Director Willard Bascom stated, "His advice and guidance during the formative years of the project was undoubtedly the most important single factor in the success of our environmental studies" (Behrman and Isaacs 1992). The other four members of the first Scientific Consulting Board (Dr. Donald W. Pritchard, Chesapeake Bay Institute; Dr. Erman A. Pearson; Dr. John H. Ryther, Woods Hole Oceanographic Institute; and Dr. Richard K. C. Lee, University of Hawaii) all served continuously from 1969 to 1979. This first Scientific Consulting Board directly influenced the sponsors by speaking for the project, whereas those following were hired to help individual SCCWRP projects. After the initial period, the composition and expertise of the consulting board varied considerably. Whereas the initial focus was on oceanography, marine biology, and engineering, the emphasis shifted to biochemistry in the mid-1980s and to toxicology in the early 1990s.



Prof. John D. Isaacs
Scripps Institution of Oceanography
University of California, San Diego

Commission Technical Advisory Group

Since 1982, the Commission and SCCWRP staff have received guidance from an advisory group made up of

TABLE 2. Southern California Coastal Water Research Project Scientific Consulting Board members, 1969-2000. Joint Power Agreement (JPA) periods given for reference, as terms generally lasted for a JPA period. (A) Position replacement lineages; (B) Expertise of members.

Agency	Year 1969-1999																														
	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
JPA PERIODS	Original O					1st Amended A					2nd Amended A2					3rd Amen. 3A					4th Amen. 4A					to 2001					
A) POSITION LINEAGES																															
Position A	John D Isaacs					R Lasker					Stephens					Donald J Reish					Luoma					AM					
Position B	Donald W Pritchard					GC					E Goldberg					W Pearcy					Castagnoli					R F Lee					Venkat.
Position C	Erman A Pearson					RM					Goldm.					Thomas P Singer					D Cacchione					Dickey					
Position D	John H Ryther					Paul Dayton					J Capuzzo					Kaplan					U Varanasi					J Stein					
Position E	Richard K C Lee					Perry McCarty					R B Spies					Richard C Swartz															
Rapporteur																										D J Reish					
B) MEMBER EXPERTISE																															
Oceanography	Donald W Pritchard															D Cacchione					Dickey										
Marine Chem.						GC															Luoma										
Geochemistry											E Goldberg					Kaplan					Venkat.										
Biol. Oceanogr.	John H Ryther					Paul Dayton																									
Mar. Biol./Oceanogr.	John D Isaacs															R B Spies					AM										
Fisheries Oceanogr.						R Lasker					W Pearcy																				
Benthic Biol.																Donald J Reish															
Toxicology																					R F Lee										
Aquatic Toxicol.																					U Varanasi										
Benthic Toxicol.																					Richard C Swartz										
Develop. Biol.											Stephens																				
Biochemistry											Thomas P Singer					J Capuzzo															
																Castagnoli															
Biochem. Toxicol.																										J Stein					
Microbiology						RM																									
Pub. Hlth/San. E.	Richard K C Lee					Perry McCarty																									
E. Engineering	Erman A Pearson					Goldm.																									

Note: Actual expertise of member sometimes differed from the subject category of a consulting board position (see Appendix ?? for individual expertises).
 Abbreviations (Names) -- AM = Alan J. Mearns; Castagnoli = Neal Castagnoli; Dickey = Tom Dickey; GC = Geraldine Cox; Goldm. = Joel Goldman; Kaplan = Ian Kaplan; Luoma = Samuel Luoma; RM = Ralph Mitchell; Stephens = Grover C. Stephens; Venkat. = Indira Venkatesan
 Abbreviations (Other): B. Ecol. = Benthic Ecology; Biol. = Biology; Chem. = Chemistry; E. Eng. = Environmental Engineering; Fish. = Fisheries; JPA = Joint Powers Agreement; Mar. = Marine; Org. = Organic; Pub. = Public; Tox. = Toxicology

scientific and technical representatives of each member agency of the Commission. From 1982 to 1990, this was the Sponsor's Technical Advisory Committee (STAC) and from 1990 to the present, the Commission's Technical Advisory Group (CTAG) (Table 3). The role of this group has been to facilitate the flow of technical information between the Commission and SCCWRP staff. Currently, CTAG plays a major role in reviewing the SCCWRP research plan and progress.

The STAC consisted initially of representatives of the four signatory agencies (excluding Ventura Regional Sanitation District). In 1987-1990, the City of Oxnard was also represented. In 1990, with the inception of the CTAG, the four signatory agencies and representatives of the new

regulatory agencies on the Commission brought the membership to nine members. Occasionally, alternates replaced the appointed representatives at the meetings. The CTAG meets quarterly before the quarterly Commission meeting, providing information from this meeting to the Commission.

From 1982 to present, 29 persons served on the STAC and/or the CTAG (Table 3). Janet K. Stull (CSDLAC) served the longest on the CTAG (18 years from 1982 to 2000). She served as chair from 1987 (when Susan Hamilton, City of San Diego, left the Committee) to 2000. John Dorsey (City of Los Angeles) served from 1982 to 1996 (14 years) and Patricia Vainik (City of San Diego) from 1987 to present (13 years).

TABLE 3. Southern California Coastal Water Research Project Sponsor's Technical Advisory Committee (1982-1990) and Commission's Technical Advisory Group (1990-present) members. Joint Powers Agreement (JPA) periods given for reference.

Agency	Year 1969-1999																																																																					
	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00																																						
JPA PERIODS	Original										1st Amended										2nd Amended					3rd Amen.		4th Amen.																																										
	O										O1					O2					A					A1					A2					A3					A4					2A					2A1					3A					4A									
STAC/CTAG																Sponsor's Tech. Adv. Com.															Commission's Tech. Advisory Grp.																																							
City San Diego																Susan Hamilton					Patricia Vainik										Walter Konopke																																							
CSDLAC																Jan Stull															Robert Horvath					Roger Baird																																		
City Los Ang.																John Dorsey										Lucy Jao					I S Cheng					M Dojiri																																		
																										Lucy Jao																																												
CSDOC	Gerlinger					Michael D Moore					C Irwin Haydock					Robertson					R Gossett					Torres					GR																																							
City Oxnard																R Montgomery																																																						
US EPA, R IX																										Janet Hashimoto					T Fleming																																							
SWRCB																										Craig Wilson					F Palmer																																							
RWQCB,LAR																															Michael Lyons																																							
RWQCB,SAR																										Gordon Anderson					S Mayville					C																																		
RWQCB,SDR	BPost.					P Otis					Bruce Posthumus					D Jones					Pete Michael																																																	

Abbreviations (Names): BP = Bruce Posthumus; C = Linda Candelaria; GR = George Robertson
 Abbreviations (Agencies): CSDLAC = County Sanitation Districts of Los Angeles County; CSDOC = County Sanitation Districts of Orange County;
 RWQCB = Regional Water Quality Control Board; LAR = Los Angeles Region; SAR = Santa Ana Region; SDR = San Diego Region;
 SWRCB = State Water Resources Control Board; US EPA R IX = United States Environmental Protection Agency, Region IX.

Project Managers/Directors

SCCWRP has had five project managers/directors and one acting director during its 30-year history (Table 4). The position defined in the JPAs was Project Manager from 1969 to 1990, Project Director from 1990 to 1994, and Executive Director from 1994 to present. Dr. George E. Hlavka (1969-1973), the first project manager, focused SCCWRP's initial efforts toward production of a "State of the Southern California Bight" report. Willard Bascom (1973-1985), who served 11 years as project manager, established SCCWRP as an important scientific research organization studying human impacts to the marine environment. Dr. Jack W. Anderson (1985-1989) promoted the integration of scientific disciplines (such as chemistry and toxicology) as well as including representatives of federal and state regulatory agencies in SCCWRP's Commission. Dr. Frank Wada (Acting Project Director, 1990-1991)

provided stability to SCCWRP during a transition period. Dr. Jeffrey N. Cross (1991-1995) shifted SCCWRP's focus to regional monitoring programs. Finally, Dr. Stephen B. Weisberg (1996-present) has expanded SCCWRP's role as a leader in coordination of regional monitoring in southern California and increased SCCWRP's role in stormwater runoff issues.

In addition to its project managers and directors, SCCWRP is also represented by a Secretary of the Authority and a Counsel for the Authority (Table 4). Lonny Dirks served the longest (17 years from 1974 to 1991) as Secretary of the Authority. B. Richard Marsh (of Knapp, Marsh, Jones, & Doran) has served as Counsel for the Authority for the entire 30 years of SCCWRP's existence, the only person in an official capacity with SCCWRP for this length of time.



Dr. George E. Hlavka
Project Manager
1969 to 1973



Willard N. Bascom
Project Manager
1973 to 1985



Dr. Jack W. Anderson
Project Manager
1985 to 1989



Dr. Frank Wada
Acting Project Director
1990 to 1991



Dr. Jeffrey N. Cross
Proj. Director/Exec. Director
1991 to 1995



Dr. Stephen B. Weisberg
Executive Director
1996 to present

Staff

SCCWRP has employed more than 200 persons during its 30 years (Table 4), with staff size increasing to 50 in 1974, and generally ranging from approximately 25 to 35 persons (with 32 persons currently on the staff) (Figure 1). SCCWRP has trained more than 100 interns and has hosted over a dozen Master's and Ph.D. projects. Many ex-SCCWRP staff members are now leaders in environmental research in federal, state, and local government agencies and at universities. The staff at SCCWRP has been subject to scrutiny, criticism, praise, and reward.

Overall, Harold Stubbs, our Marine Services Coordinator, served the longest period of time (25 years from 1973 to 1998). Tareah Hendricks, our oceanographer, served for 23 years (1970 to 1993). Dave Tsukada, in our chemistry department, has served 22 years (1978 to the present). Several staff members have left SCCWRP and returned later in their careers (fish biologist M. James Allen, 1971-1977 and 1993 to present; chemist Robert Eganhouse, 1974-1976 and 1987-1991; and sources scientist Kenneth Schiff, 1987-1991 and 1995 to present).

Over the years, the organization has consisted of a number of departments, including administration, engineering, sources, oceanography, chemistry, and biology (fish biology, benthic biology, and toxicology). Recently, Executive Director Weisberg has added information management, statistics, and

microbiology to SCCWRP's disciplines. Administration, biology, chemistry, and sources departments have been important components of SCCWRP during its entire 30-year history (Figure 1).

During its history, the research focus of the departments has shifted as critical issues changed, as information gaps were filled, and as the expertise of SCCWRP scientists changed through the addition and departure of staff. The Oceanography Department under Dr. Tareah Hendricks's direction focused on ocean modeling, developing models of discharge plumes, sediment resuspension, and dispersal of contaminants by currents. The Sources Department (led throughout much of this period by Henry Schafer) generally quantified contaminant inputs to the Southern California Bight from publicly owned treatment work (POTW) discharges (although inputs from all sources were investigated). However, as effluents improved to meet State of California Ocean Plan standards, the focus shifted in the late 1990s (under the direction of Ken Schiff) to stormwater and other non-POTW sources. Initially, the Chemistry Department led by Dr. David Young focused on the extent of chlorinated hydrocarbon and trace-metal contamination in sediments and the biota. In the early 1980s (under the leadership of Dr. David Brown), the department shifted to understanding the impact of contaminants on biochemical mechanisms. In the late 1980s, the Chemistry Department under Dr. Robert Eganhouse shifted to geochemistry in deeper water and in the sea surface microlayer, whereas that of Dr. Eddy Zeng in the 1990s developed molecular markers tracing contaminant inputs and improved detection of water-column concentrations using an *in situ* pump.

The Biology Department (initially led by Dr. Irwin Haydock and then by Dr. Alan Mearns) focused on a wide range of projects to determine what parts of the biota (phytoplankton, benthos, and fish) were affected by wastewater discharge. Under Dr. Mearns, fish studies focused on fish pathology (led by Margie Sherwood) and fish community organization (led by M. James Allen), while Benthic studies (led by Jack Word) focused on taxonomic intercalibration and an infaunal trophic index. Since the early 1980s, the Fish, Benthic, and Toxicity departments have been separate. In the 1980s, the Fish Department (under Dr. Jeffrey Cross) focused on the impact of DDTs on fish biology and in the 1990s (under Dr. M. James Allen) on historical trends and regional assessments of fish assemblages and contamination. The Benthic Department (under Dr. Bruce



Harold H. Stubbs

TABLE 4. Southern California Coastal Water Research Project directors and staff, by discipline, 1969-2000.

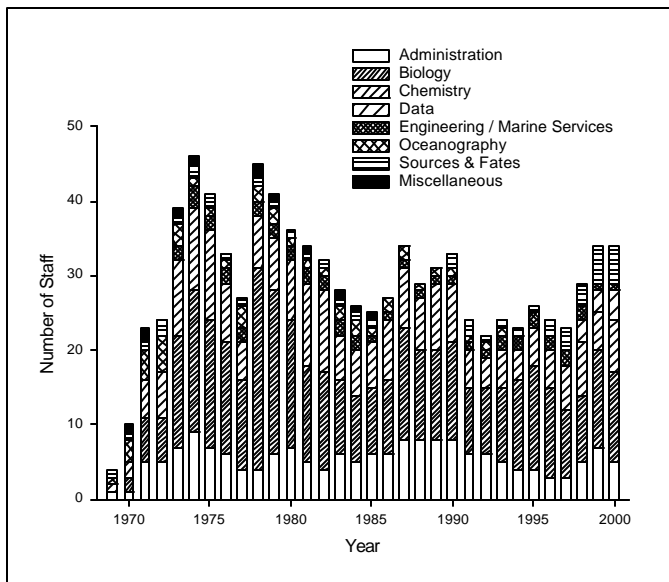
Position	Year 1969-2000																																	
	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00		
JPA PERIODS*	Original																Amended								2nd Amended				3rd Amen.		4th Amen.			
	O		O1		O2		A		A1		A2		A5		A6		2A		2A1		3A		4A											
LOCATION	W1		Westwd2		El Segundo				Long Beach																Westminster									
STAFF																																		
Directors	George Hlavka				Willard Bascom								Jack Anderson				Wada		Jeffrey N Cross				S B Weisberg											
Asst. Director	K												JC																					
Secr. for Au.	J R Foster		RMC		Lonny Dirks								Jeffrey N Cross				F		S B Weisberg															
Asst. Sec. Au.					Charles N Halgren				Diane M Wiley				C Francisco				C F		DC		B Nece													
Counsel Au.	B Richard Marsh																																	
Alternates					J Thomas A Doran				H				Thomas A Doran				H		Thomas A Doran															
SMBRP PDir.	Yamaguchi																																	
Administration																																		
Admin. Officer	Charles N Halgren																Diane Wiley				Christopher Francisco				DC		B Nece							
Admin. Analyst																					D (Vuong) Yorba				D (H) Elmore									
Admin. Asst.	Barney		Elizabeth Steiger		LB		L Winter		D Wiley		K K		KF		M vB		SU		C Barrett		Debbie Hallock		B		EWE		EB							
Secretary	MS		E Steiger		L Sturges		K Crum		WAS		Gangon		SVL		Lisa Winter		E P		Hallock															
Admin. Staff	DM		c		B Trager		J G		AC				RM		Turpin																			
Admin. Staff	L Word																																	
Librarian																	S (V) Laughlin																	
Editor	Robin A Simpson																												J Nelson		P K			
Illustrator	CB																																	
Data Processing																																		
Info. Mgt/Mgr	L Cooper																																	
Info Mgt/Programer	Ferreri																																	
Network Mgr	P Smith																																	
Statistics	M Leecaster																																	
GIS Biology	SM																																	
GIS Geology	MM																																	
Engineering																																		
Mar. Services																	Harold H. Stubbs				Dario Diehl													
Mar. Engineer																	Jack Mardesich																	
Mar. Serv. Asst.			Michael D Moore		Manzanilla		Moore		GPHer.		Dario Diehl				D Tsukada																			
Sanit. Engineer	RS		AA																															
Sources/RM																																		
Source Sci/PI	Y-Y Tsai		CSY		Mitchell		Henry A Schafer								Schiff				Kenneth Schiff															
Reg. Monit. Coord.					HAS								M J Allen																					
Source Asst.													K Schiff				Valerie (Raco) Raco-Rands																	
Source Data	Tiefenthaler																																	
Source Modeler	DA																																	
Source Nutrients	JM																																KK	
Source Tech	A St.																																	
Oceanography																																		
Ocean Mod./PI	Tareah J Hendricks																																	
Oceanographer	J Jones		K		C		Herring		Moore		N C																							
Oceanog. Tech.	J R Taft		JH		BK				Dario Diehl																									
Chemistry																																		
PI Chemistry	David R Young								David A Brown								R Eganhouse				Eddy P Zeng													
Org/Geoc. Sci	Theodore C Heeson								Richard W Gossett								Kim Tran				JN													
Org/Bioch Tech	E Leong		E Berkhiser		Gossett				Peter Szalay				Marilyn Castillo				D Tsukada																	
Org/Bioch Tech	G Shiller		I Cer.		R J		Liu Hu		K Hill		Azra (Khan) Hussain																							
Org/Bioch Tech					WL								Charlie Yu				AB																	
Org/Bioch Tech	Westbrook								Charles Ward				Cherry (V) Ramos				Diana Young																	
Org/Bioch Tech									Alvin Wescott				AZ																					
TMetals/Geoc. Sci.	Tsu-Kai Jan																																	
TMetals/Geoc. Sci.	J N Johnson		Eganhouse		G. Patrick Hershelman																													
Chem Data An					D J (V) McDermott																													
Chemistry Tech	KC		Hershelman		PC		Alfajara		M Jain																									
Chemistry Tech	C P Patrickson		Picard		Raco-Rands																													
Chemistry Tech	Smokler								SMch																									
Microbiology																																		
Microbiol Sci					Kim				Morris								R Noble																	
Microbiol Lab					C K Ho																													

Table 4 continued.

Position	Year 1969-1999																																					
	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00						
Biology																																						
Biology Sci/PI	C I Haydock		Alan J Mearns										Jeffrey N Cross										M James Allen															
Fish Biol Sci/PI	Mearns																																					
Fish Ecologist	M James Allen																																					
Fish Pathologist	Marjorie Sherwood																																					
Fish Biol Asst	Gammon		Robert Voglin												M D Moore		Dario Diehl										Shelly L Moore		VR									
Fish Tech											E Man.		Engelhart										LC		LC													
Fish Tech											Valerie (Raco) Raco-Rands										LH		LH		JK													
Benthic Sci/PI	C S Greene										J Q Word		Bruce E Thompson										Mary Bergen		A Rana.													
Benthic Ecol.	J Q Word																																					
Benthic Asst	T S Sarason		Brad Myers		P Striplin										Jimmy Laughlin																							
Benthic Data											J Laughlin										L Cooper																	
Benthic Illustr.	Charwat																																					
Benth Eff. Tech											David Tsukada																											
Benth Eff. Tech											Lance Horita										R Gonzales		A Jirik		LH													
Benth Tech	Leslie Harris										Jim Roney		Diane O'Donohue										Liesl Tiefenthaler															
Benth Tech	CD		GF		m Davis										Beaton		FCummings										M A											
Benth Tech											M Sonoda																											
Intertidal Biol.	A Miller										Leslie Harris																											
Biol. Oceanog	Michael D Moore										G Kleppel																											
Biol. Oc. Asst	Lucinda S Word										E Man.																											
Biol. Tech.	Edward Motola										D Mus.		BT																									
Biol. Tech.											Nishina																											
Biol. Tech.	WL		MK		CW										RM		StM										KM		AH									
Biol. Tech.	PS												BH										DM		CR		DS											
Biol. Tech.											Iwafuchi																											
Biol. Tech.											RJ																											
Biol. Tech.											La																											
Biol. Tech.											GM																											
Biol. Tech.											BM																											
Biol. Tech.											Missetch																											
Biol. Tech.											DP																											
Biol. Tech.											AS																											
Biol. Tech.											LS																											
Biol. Tech.											TT																											
Biol. Tech.											MV																											
Toxicol Sci/PI	Phillip Oshida										Steven M Bay																											
Lab Coord.																					Greenstein																	
Toxicol Asst	Jean L Wright										TG		A Ha		Darrin Greenstein																							
Tox. Biomkr																					Jeff Brown																	
Toxicol Tech											Karen Engelhart										D Comp.		LC		Andrew Jirik										ED			
Toxicol Tech																					JZ		Jeff Brown										Ann Zellers		Koons			
Toxicol Tech																							HS										C L		NL		KJ	
Toxicol Tech																																			Van			

Abbreviations: JPA=Joint Powers Agreement; Location: W1=first Westwood location; Directors: JC=Jeffrey N Cross; K=Andrew Kemmerer; Wada=Frank Wada; Secretary of Authority -- BN=Bryan Nece; CF, F=Christopher Francisco; DC=David Caldwell; RMC=R M Clarke; Legal Counsel for Authority -- firm Knapp, Marsh, Jones & Doran; H=Daniel V. Hyde; J=James G. Jones; SMBRP Prog. Dir.=Santa Monica Bay Restoration Project Program Director; Yamaguchi=Marianne Yamaguchi; Administration: AC=Andrea Cullins; AS=Annette Sculman; B=Duane Beverly; C=Janet Conley; CB=Christine Bondante; DC=Dave Caldwell; D(H) Elmore=Debbie (Hallock) Elmore; DM=Dorothy McGlenn; EB=Emily Briscoe; EP=Ellina Preston; EWE=Erica (Walthers) Ellertson; JG=Jill George; KF=Karen Foreman; KK=Karen Keele; LB=Linda Burgner; MS=Marjorie Sherwood; MvB=Miwa von Borstel; PK=Paul Konrad; RM=Rita Mattilla; SU=Sylvia Urbina; SVL=Sherry Laughlin; W=Cindy White; Data Processing: L Cooper=Larry Cooper; Ferreri = Glenn Ferreri; MM=Meg Mcquarrie; P Smith = Paul Smith; SM=Shelly Moore; Engineering: AA=Alan Abati; GPHer=G Pat Hershelman; Moore=Michael D Moore; RS=Richard Surynt; Sources/RM(=Regional Monitoring): A St.=Andrea Steinberger; CSY=Chen-Shyong Young; DA=Drew Ackerman; HAS=Henry A Schafer; JM=Jessica Morton; KK = Krista Kamer; Mitchell=Floyd Mitchell; Oceanography: BK=Bradley Kirst; C=Alfred Carsola; Herring=James Herring; JH=John Harding; K = Robert Kendall; Moore=Michael Moore; NC=Niels Christensen; Chemistry: AB=Alex Bolkhovitinov; Alfafara = Jennifer Alfafara; E. Man. = Enrique Manzanilla; ICer. = Ileana (Szpila) Cerreno; JN=Jim Noblet; KC=Kimm Crawford; PC=Paul Callinan; Picard=Paul Picard; Raco-Rands=Valerie Raco-Rands; RJ=Robert Johnson; SMcH=Sophia (McHugh) Santy; Smokler=Paul Smokler; Westbrook=Michael Westbrook; WL=Wayne Luke; Microbiology: Kim=Jay Kim; Morris=Robert Morris; R Noble = Rachel Noble; Biology: AH=Andrea Huvad; AHa=Ann Haeckl; A Rana.= Ananda Ranasinghe; AS=Alan Seydoux; AZ=Ann Zellers; Beaton=Tara Beaton; BM=Bill McKeon; BH=Bradley Hartwell; BT=Bruce Teter; CD=Corey Dzitler; Charwat = Danuta Charwat; CL=Craig Liu; CR=Catherine Rice; CW=Chung-Ching Wang; Davis=Cynthia Davis; DCompt=David Compton; DM=Donna Moscher; DMus=Donald Musslewhite; DP=Dean Pasko; DS=Douglas Stone; ED=Ehren Doris; EMan= Enrique Manzanilla; Engelhart=Karen Engelhart; Gammon=Ricard Gammon; GF=Gary Ference; GM=Gregory McBride; HS=Schoenhoefer; Iwafuchi=Larry Iwafuchi; JK=Julianne Kalman; JZ=Joe Zarnoch; KJ=Kimberly Johnson; KM=Kim Miller; Koons=Kenna Koons; La=William; Lansford; LC=Larry Cooper; LH=Lori Hosaka; LS=Lisa Smith; m=Tom McDonnell; MA=Mario Alvarado; Missetch=Dennis Missetch; MK=Marcia Kerwitz; MV=Meta Vander Meydan; Nishina=David Nishina; NL=Nikki Leach; PB=Paul Berkman; PC=Paul Costa; Randolph Johnson; RM=Raphael Mujeriego; Steve McGown; TG=T. Kim Goochey; TT=Terry Taforo; Van = Daniel Van VR = Raco-Rands; WL=Wendy Littell

FIGURE 1. Number of Southern California Coastal Water Research Project staff (total and by discipline) by year, 1969-2000. (Note that because of intra-annual turnover, the number of the staff shown for a given year is often greater than the number of positions occupied during the year).



Thompson) focused on reference site and trawl invertebrate studies in the 1980s, shifting in the 1990s (under Dr. Mary Bergen) to regional assessments and the development of a benthic response index. The Toxicity Department (initially under Phillip Oshida and later under Steve Bay) tested and developed toxicity tests (e.g., the sea urchin fertilization test and amphipod tests) useful for the marine environment, and helped to standardize toxicity testing procedures on the West Coast. In the late 1990s, a newly formed Information Management Department (under Larry Cooper) focused on standardizing information management procedures within southern California and across the U.S.

During its 30-year history, SCCWRP has resided at five different locations: Westwood 1 (1969-1970); Westwood 2 (1970-1973); El Segundo (1973-1979); Long Beach (1979-1993); and Westminster (1993-present) (Table 4).

SCCWRP Growth and Maturity

Review of the charts depicting joint powers agreements, staff, Commission, consulting board, and CTAG history (Tables 1, 2, and 3) reveals some important trends and periods. With the exception of nominal staff turnover, the first 10 years of SCCWRP were characterized by stable governance from the major sponsor governments. The composition of the Scientific Consulting Board began to change in the late 1970s, with shorter periods of membership occurring in the 1980s. In the early 1990s, scientific guidance shifted from national to local and state expertise.

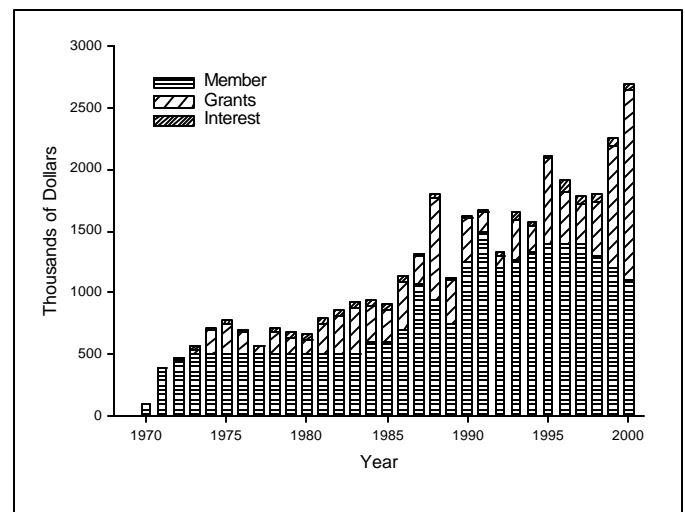
In addition, governance shifted dramatically in the late 1980s, with the explicit inclusion of regional, state, and federal regulatory agency representation.

In part, we believe these changes reflect the growing local, state, and nationally recognized expertise of the SCCWRP staff itself. Indeed, by the late 1970s, SCCWRP senior technical staff was being asked to serve on planning and review committees elsewhere at the state, national, and international levels. This recognition actually started in 1974, when the Director and one staff member attended a marine pollution conference in Italy. By 1979 SCCWRP staff were advising officials of the State of California on wastewater planning and monitoring programs in central California and San Francisco Bay, and also officials of the state of Washington (Seattle METRO). In 1980, senior staff scientists participated and chaired sessions in a major review of the New York Bight. After 1980, when many of the former senior staff moved on to other agencies or positions, they, together with the new senior staff, continued to serve as consultants locally, nationally, and internationally, largely because of the expertise they gained at SCCWRP.

FUNDING

The original basis for JPA funding was a self-imposed tithe of approximately 50 cents per 1 million gallons per day of wastewater discharged by each of the five initial JPA sponsors. During this time, JPA agency funding was \$500,000 per year from 1973 through 1983, which increased to a maximum of \$1.4 million in 1996 and 1997 (Figure 2). As prescribed in the 1997 JPA, that funding began decreasing by \$100,000 per year in 1997. The JPA was the dominant funding source through the entire period, but in 2000, contracts and grants contributed the majority of the funding.

FIGURE 2. Southern California Coastal Water Research Project funding (total and by type) per year, 1969-2000.



During the 30-year period, FY 1970 through FY 1999 [Note that FY 1970 is the year ending June 30, 1970], SCCWRP received a total of approximately \$34 million with a long-term annual average of approximately \$1.13 million. Of this, the JPA sponsors provided about \$24 million and dozens of other government and nongovernmental agencies about \$10 million. The grants and contracts have been awarded by the National Oceanic and Atmospheric Administration (NOAA), the U.S. EPA, and the State of California. For many years during the 1980s and 1990s, SCCWRP also received funding from affiliate local wastewater management agencies.

Total funding has increased almost continuously over the 30-year period (Figure 2). [Data for this analysis were extracted from various sources including annual and biennial reports, when available, and budget worksheets. These data may not be strictly accurate on a fiscal year basis as some years data were reported on a calendar year]. After an initial installment of several hundred thousand dollars during FY 1970 (1969-1970), annual funding increased to about \$700,000 –to \$900,000 per year during the 1970s with a maxima of \$2.1 million in 1996 and \$2.25 million in 1999. The estimated total funding for FY 2000 is \$2.7 million, the highest in SCCWRP history.

After successful proposals, the first non-JPA funding to SCCWRP began in 1972 with two grants from U.S. EPA's Office of Research and Development, one to quantify ecological impacts of wastewater discharges (A. Mearns, Principal Investigator); and a second to document the inputs, fate, and transport of chlorinated organic contaminants (D. Young, Principal Investigator). Since then, the directors and staff have successfully competed for grants and contracts from federal agencies. The NOAA and U.S. EPA have provided relatively large grants for work on subjects ranging from fish pathology to monitoring methods development, oceanographic modeling and simulation, assessment of assimilative capacity, and organic contaminant partitioning. Other federal sponsors have included the Minerals Management Service (Outer Continental Shelf surveys and a synthesis book on the Southern California Bight) and the U.S. Geological Survey. State agencies, most notably the State Water Resources Control Board and the State Department of Health Services, have provided grants and contracts to assess sea food contamination and contaminant fate. With smaller, but significant, sources of funding, SCCWRP has provided services to smaller municipalities and other local government public utility agencies (water, flood control, power), provided needed support for upgrading sponsors' monitoring methodologies and training their staff, and for regional monitoring and assessment of contaminant inputs from all sources including surface water

runoff, power plant discharges, aerial fallout, smoke plume fallout, etc. SCCWRP has also provided services to industries (including the American Petroleum Institute, Chevron, and others) for regional intercalibration (taxonomy and chemistry) and assessments of the impacts of produced water discharges of offshore drilling platforms.

SCIENCE

The focus of SCCWRP's scientific activities has evolved during its 30-year history. From 1969 to 1973, the focus was on production of "Ecology of the Southern California Bight: Implications for water quality management" (SCCWRP 1973). This report was the second major compilation of information of the Southern California Bight (the first being Emery 1960), and the first to focus on marine pollution issues. During the 1970s, SCCWRP increased emphasis on research, focusing on fish diseases, contaminants, and oceanography. During the 1980s, the emphasis was on mechanisms and biochemical and toxicological studies. During the 1990s, SCCWRP shifted its emphasis to sediment quality criteria, integrated coastal management, and watershed management. During this period, SCCWRP's efforts have expanded to include the coordination of marine monitoring in southern California, with continued research into pollution impacts. By 1998 the coordinated monitoring effort involved 62 organizations and extended SCCWRP's efforts into microbiology.

Science Model and Research Plans

SCCWRP's scientific investigations, analytical methods, and technological innovations have provided decision-makers and the public with information and tools for evaluating the status of the coastal ecosystem and the consequences of alternative management actions. The primary product of SCCWRP has been the development and dissemination of new knowledge. This end result is an entirely different mission than that of standards and regulatory programs, which have been focused directly on the compliance and enforcement of existing quality criteria. These two missions were highly complementary, although not always at the same time. In a sense, SCCWRP was designed to provide *the basis for establishing criteria and the means to measure man's effectiveness and progress toward achieving those criteria*.

SCCWRP's scientific model has been based, in part, on a conceptual model of the marine environment. The model described the many interactions that marine organisms might have with their environment and foreign materials, the numerous pathways and transformations that might occur to materials discharged to the sea, and the possible

effects of contaminants from various sources. SCCWRP's conceptual model has taken on several forms over the past three decades (Isaacs 1975, Cross 1995) but its principal tenets remain unchanged: Marine ecosystem health is the result of many forces, both natural and man induced. While the effects of pollutants on fish and wildlife may be the same in terrestrial, aquatic, and marine systems, the fates, transformations, and transport of pollutants are much different in the sea than on land or in freshwater systems, both in quality and scale.

Accordingly, SCCWRP's science struck a balance between several disciplinary activities (marine ecology, oceanography, the chemistry of contaminants, and the comparison of contaminant inputs) over a long period of time and on a geographic scale that had direct impact on the ecosystem of the Southern California Bight and in some ways on the scientific community in other parts of the country and the world. In short, SCCWRP scientists were required to document the status of the health of marine life; to monitor the trends affecting marine health; to document the sources, fate, and transport of contaminants; to pay attention to changing ocean conditions; and to test apparent cause-effect relationships with carefully planned field and laboratory experiments. All of these goals were accomplished across a geographic scale that provided an understanding of what is "normal" to be used as a measure to determine what is not.

Finally, SCCWRP's budget was not infinite. Choices had to be made and priorities had to be set and followed through. Often the tools necessary to make needed measurements and models were not available, so SCCWRP staff had to develop their own methods. The large geographic scale on which SCCWRP operated necessitated that SCCWRP scientists work directly and collaboratively with their counterparts in other local, regional, and state organizations and with other industrial and nongovernment stakeholders. They were driven by purpose to make effective use of the data, hypotheses, and information provided by these organizations under other auspices, such as permit monitoring programs.

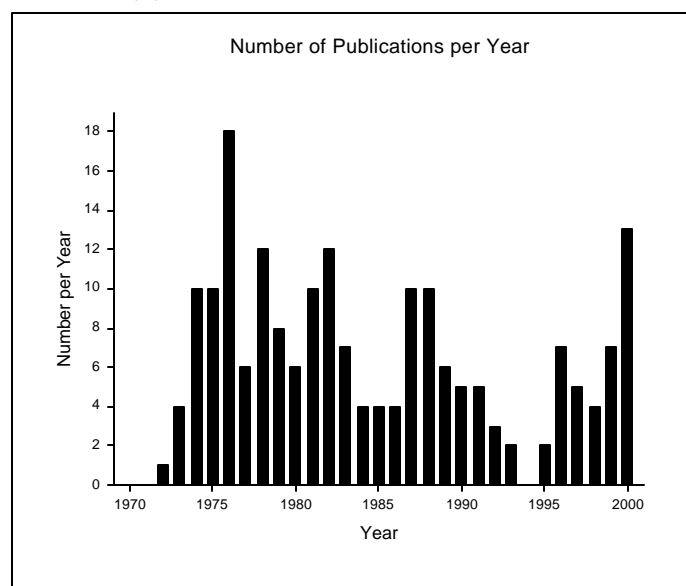
The SCCWRP Commission, Scientific Consulting Board, and CTAG, as well as SCCWRP staff, played important roles in prioritizing directions and setting priorities. Staff work progressed by identifying uncertainties that needed to be resolved to confirm (or reject) problems, quantify their scale (assign importance), and, where needed, suggest effective management alternatives on specific issues. Tasks were outlined in a research plan. The work continued by making measurements in the field (thanks to *gratis* ship time and volunteers from sponsoring agencies) or in the laboratory, or by conducting computer modeling

exercises. Results were compiled, reports were written, and peer review was conducted. Results passing multiple levels of scrutiny helped to reduce the uncertainty about specific issues and build a case for or against specific allegations and concerns.

Overview of 30 Years of Research

The primary product and record of SCCWRP's work is the body of written documents, reports, and publications. Over the past 30 years, SCCWRP scientists, technicians, and engineers have produced 195 peer-reviewed scientific publications, 114 technical reports, and 395 articles in annual and biennial reports (Figures 3, 4, and 5) (these documents are listed on the SCCWRP web site, www.sccwrp.org). In reviewing the subjects of SCCWRP annual and biennial report articles, the balance and changes in subjects addressed over time by the Project become apparent.

FIGURE 3. Number of Southern California Coastal Water Research Project peer-reviewed publications by year, 1969-2000.



Considering all of the articles published since 1973, over one-half of the SCCWRP annual and biennial report articles have focused on the effects of pollution on marine life; approximately one-quarter on the transport and fates of pollutants; and approximately one-fifth on sources (Figures 5 and 6). A small but important number of papers focused on vision (directors' statements and conceptual models) and synthesis. A closer look at each of these major categories indicates that SCCWRP has undertaken a wide range of activities with no one area dominating (Figure 6).

FIGURE 4. Number of Southern California Coastal Water Research Project technical reports by year, 1969-2000.

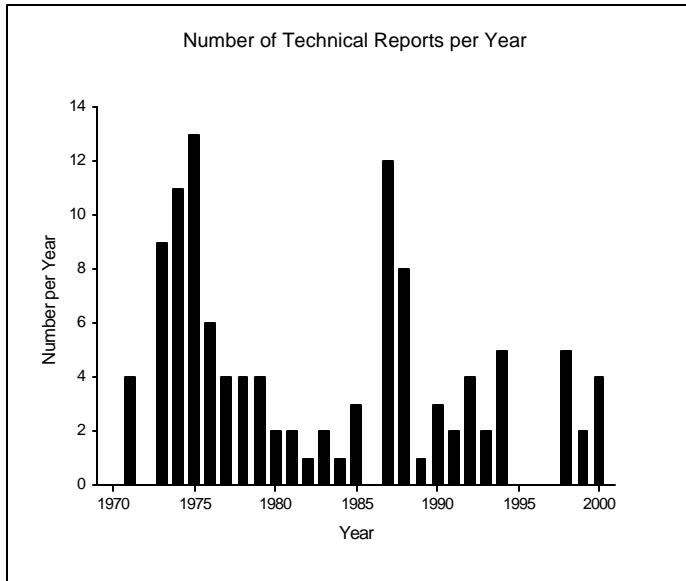
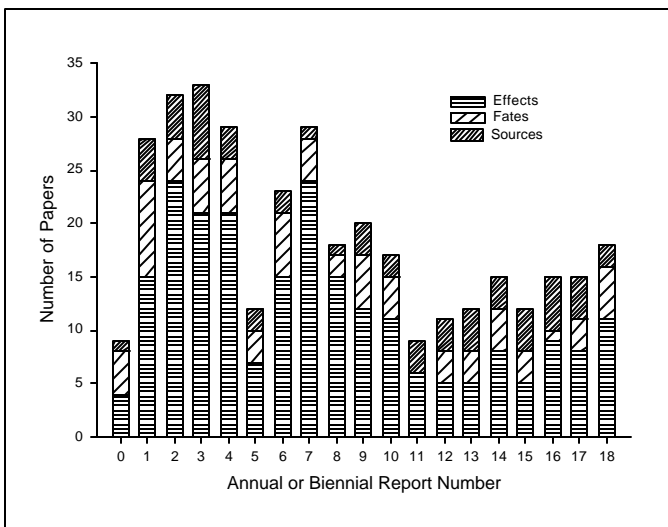


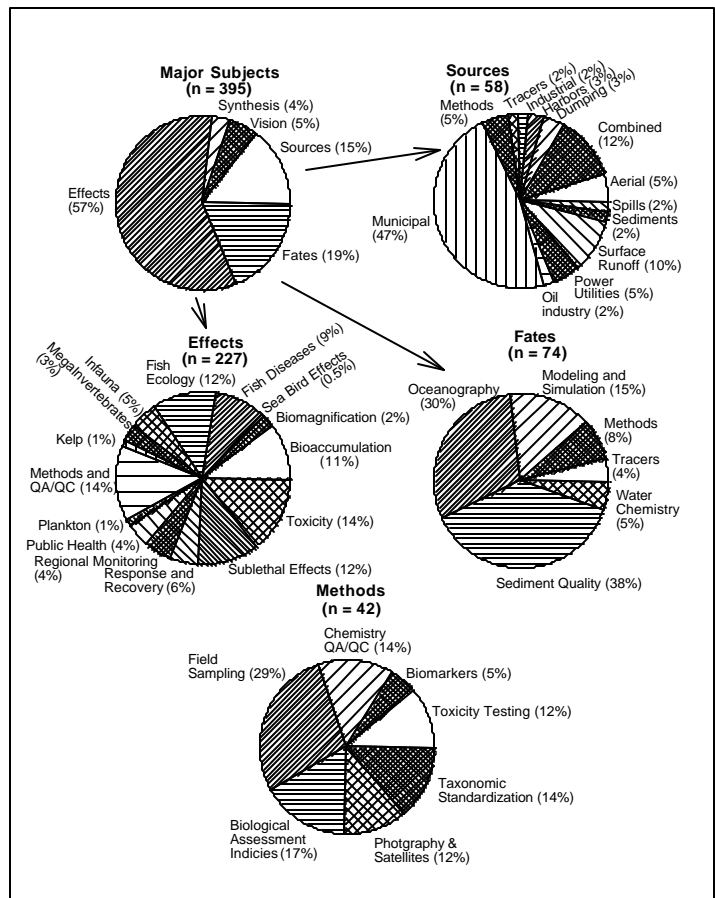
FIGURE 5. Number of Southern California Coastal Water Research Project annual report papers (total and by subject) per year, 1969-2000.



Sources and Inputs

At least 58 articles in the SCCWRP reports addressed inputs of materials to the Southern California Bight (Figure 6). Although nearly half of these reports focused on inputs of materials from municipal wastewaters, inputs from at least 10 other categories of sources have been assessed as well. These include surface runoff, produced water and other industrial discharges, direct aerial input, spills, dumping, in-place contaminated sediments, and harbors and marinas as sources of discharges to the coastal region. Some studies were based upon traditional sampling methods, while others required special focus, rapid response, and

FIGURE 6. Number and percent of Southern California Coastal Water Research Project annual report papers by major and specific subjects, 1969-2000.



unique sampling strategies. Among these unique studies were investigations of the aerial fallout of DDT from landfills (Young *et al.* 1973), the fallout of metals from major brush fires (Young and Jan 1977), and diver sampling to monitor the output of trace metals from power plant discharges. When appropriate, combined sources were compared. These comparisons can provide considerable insight concerning where actions will produce the greatest benefits. As a result of this work, southern California regulators have had among the most comprehensive assessment of total mass loadings, and their trends, of any other state in the country.

Apparently, the publication of mass input data is so rare that the authors of one international university oceanography textbook (Duxbury and Duxbury 1994) cite and update SCCWRP data as it becomes available.

Transport, Transformation, and Fates

At least 74 articles have dealt with the transport, transformation, and fate of contaminants and other materials (Figure 6). Most of the past oceanography, modeling, and simulation papers addressed a wide range of issues

concerning the dilution, dispersion, bioaccumulation, settling, and resuspension of contaminants near the discharges, through work led by former SCCWRP oceanographer Tareah Hendricks. A few have reported on studies designed to look at larger scale dispersion and have complemented work conducted by the CalCOFI program and projects at USC. SCCWRP scientists have pioneered methods such as comparing concentrations of contaminants in mussels with far-field transport models, using mussels suspended at depth to measure the release of contaminants from deep-water sediments, and using “organic partition coefficients” to predict levels of contaminants in marine life and sediments.

Effects

Fully 227 SCCWRP papers focused on evaluating the effects of man and nature on marine resources of the Southern California Bight (Figure 6). Over the years, SCCWRP has worked on the effects of contaminants on marine life and human health, striking a balance among several categories. SCCWRP reports have addressed acute, chronic, and sublethal toxicity of wastewater and contaminated sediments, and the processes of bioaccumulation and biomagnification (relevant to human health as well as wildlife issues). While much of this work has been completed in the laboratory, discharger and large-scale cooperative surveys (see below) have provided many opportunities to verify theories about toxicity and bioaccumulation in the field.

Working with sponsor colleagues, SCCWRP biologists have described in great detail the structure, function, and trends of marine plant and animal communities on the mainland shelf of the Southern California Bight. SCCWRP has documented the distribution and abundance of several hundred species of fish and thousands of species of marine invertebrates and plants, and detailed changes that have occurred as a result of wastewater management actions and natural events such as El Niño events. Of equal importance, the biologists have subjected data to various models and provided a clear understanding of the biological zones at various depths offshore. These analyses have led to the development of indices for judging the health of benthic and fish communities. Staff, contractors, and sponsor scientists documented the disappearance of diseased fish populations and recovery rates of previously altered benthic communities.

Teams of chemists and biologists have monitored the contamination and recovery of sediments, fish, seabirds, marine mammals, and shellfish, exploding popular myths about the biomagnification and bioaccumulation of pollutants. Project toxicologists have documented the effective-

ness of treatment, source control, and diffusers in mitigating wastewater and industrial effluent toxicity and mapped the toxicity of nearshore sediments. Since its inception, SCCWRP has squarely addressed human health issues through studies of surface transport of bacteria (SCCWRP 1973), attempts to recover viruses and bacteria from shellfish, surveys of seafood contamination and consumption, and recent region wide surveys of shoreline bacteria, conducted in partnership with other agencies.

Regionwide and Cooperative Surveys

To gain regionwide perspective and to understand processes that must be sampled in space and time on the scale at which they operate, SCCWRP surveyed the entire Southern California Bight. The first regionwide deep basin and mainland shelf biological surveys (Albatross surveys did this in the 1880s but all species were new) were conducted between 1952 and 1960 by the Allan Hancock Foundation at the University of Southern California. This work provided the initial basis for SCCWRP and the sponsors to compare conditions around the outfalls with background conditions (SCCWRP 1973).

The first SCCWRP large-scale, regionwide contaminant survey was conducted in 1971 when teams led by David Young sampled mussels for contaminants. Mussels were collected from numerous island and mainland locations, analyzed, and the results displayed on maps (SCCWRP 1973). The survey was repeated in 1974, and eventually many of the sites became part of the California State Mussel Watch Program and the NOAA National Status and Trends Program (Mearns *et al.* 1991). In addition, SCCWRP and sponsor chemists participated in regionwide surveys of contaminants in wastewater effluents.

In 1973 SCCWRP conducted its first interagency regional offshore ecological survey. However, the survey was restricted to outfall areas off Los Angeles and Orange counties. During the summer of 1977, SCCWRP conducted the 60-Meter Survey, the first large-scale mainland shelf ecological survey since 1960 (Word *et al.* 1977, Word and Mearns 1979). This survey sampled water chemistry, demersal fishes and epibenthic invertebrates, and benthic infauna along the 60-m isobath from Point Conception to the United States-Mexico international border to assess the extent of pollution impacts in southern California at the depth of the major wastewater outfalls. The 60-Meter Survey involved 6 vessels and 12 cruises, and collected 998 samples at over 70 sites. Many staff from sponsoring agencies and universities participated. A small number of those sites, mainly in reference areas away from the major outfalls, were resampled in 1985 (the 1985 Reference

Survey) (Thompson *et al.* 1987) and again in 1990 (The 1990 Reference Survey) (Thompson *et al.* 1993).

During the late 1970s and early 1980s, SCCWRP attempted to encourage regulatory agencies and POTWs to participate in periodic regionwide surveys, suspending NPDES permit requirements if necessary (e.g., Bascom 1982). SCCWRP and SCCWRP sponsors provided considerable input into a National Research Council review of marine environmental monitoring (NRC 1990a), including production of a separate review exclusively focused on the Southern California Bight (NRC 1990b) and the need for regional monitoring. That approach came to fruition with the 1994 Southern California Bight Pilot Project (SCBPP; Cross and Weisberg 1996), under the leadership of Director Cross. The survey was conducted from July to August 1994, and differed from the 60-Meter Survey in expanding the depth range sampled from 10 to 200 m, encompassing the coastal shelf from Point Conception to the United States-Mexico international border. Whereas the previous survey was conducted largely by SCCWRP, with some participation by SCCWRP sponsoring agencies, the SCBPP was a truly cooperative effort, with 12 local, state, and federal agencies participating. In addition, three new features were added: (1) a strategy based upon a probability-based survey design, (2) inclusion of sediment toxicity as a new measure, and (3) intense interagency quality assurance and quality control procedures. The SCBPP collected and analyzed 261 water samples, 252 benthic samples, and 114 trawl samples. Recently, all these efforts were expanded in scope and participation, culminating under the leadership of Executive Director Weisberg in Bight'98. In 1998, the regional survey was enhanced to include 62 sponsoring agencies and organizations. In addition, the survey area was expanded to include bays and harbors on the mainland and the offshore island shelf. The first regionwide shoreline bacteria survey to assess to what degree it was safe to swim along southern California beaches was added to this study. As an adjunct study, shoreline microbiology, sediment chemistry, and infaunal surveys were conducted in northwestern Baja California, Mexico, by Mexican scientists at the same time and by the same methods.

Other cooperative regional-scale efforts between SCCWRP and other agencies have been conducted. In 1976, with funding from NOAA, SCCWRP biologists coordinated fish pathology and chemistry surveys in Los Angeles County, in Seattle, and in the New York Bight. These surveys were designed to understand similarities and differences among diseased fish populations. In addition, NOAA and SCCWRP staff collaborated in an extensive review and synthesis of contaminant trends in southern

California sediments and biota, coordinated by the senior author of this paper (Mearns *et al.* 1991). SCCWRP is also presently serving as the California coordinator for the Western Environmental Monitoring and Assessment Program (EMAP), a national EPA coastal monitoring program. Many of the methods and information management approaches used in Western EMAP were taken directly from the 1998 regional survey.

Method Development and QA/QC

At least 42 of the SCCWRP annual and biennial report articles have addressed the development of methods, including quality control and interagency standardization. SCCWRP scientists have addressed a wide range of field and laboratory methods over the years (Figure 6). From its inception, SCCWRP was very concerned about the comparability of the wide array of methods being used to survey coastal sites. The SCCWRP chemists worked in sponsor and university laboratories to develop regionally acceptable methods for extracting and analyzing contaminants. Under funding from EPA, the numerous trawl, grab, and core sampling devices used in California were tested and compared for sampling effectiveness; and recommended methods were published. During the period from the late 1970s to the 1990s, SCCWRP toxicologists tested and modified methods for measuring the toxicity of effluents, water, and sediment samples. But perhaps the greatest achievement has been SCCWRP's support for the establishment and continuation of regional QA/QC groups, most notably the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT), the Southern California Environmental Chemists Society (SCECS), and the Southern California Toxicology Assessment Group (SCTAG).

ACCOMPLISHMENTS

Measures of SCCWRP's accomplishments include its longevity, the products of its staff and directors, its usefulness to sponsors and resource managers, and the long but successful effort to attain stakeholder acceptance and inclusion. The facilitation of dialogue among regulators and dischargers is a feature found nowhere else in the country. However, while process is important, the ultimate measure is the health of the coastal environment and man's understanding of the factors that determine its health.

The Southern California Bight is cleaner than it has been since World War II (Mearns *et al.* 1991). Obviously, it is presumptuous to conclude that SCCWRP is responsible, let alone that SCCWRP's role in reducing contamination can be measured. The decline of contamination is the result

of actions taken by the sponsors and state and federal regulatory agencies. These agencies had to take pollution control actions (product control, source control, increased wastewater treatment) based upon many factors: public pressure, compliance with changing criteria, economics, and science. SCCWRP, with support from all sponsors (state and federal regulatory agencies as well as dischargers), and in conjunction with sponsor and agency scientists and many advisors and stakeholders, has provided much of the science necessary for the understanding of the condition of the marine environment and alternatives for management action.

From the point of view of SCCWRP scientists, not all regulatory decisions and actions have been rational (i.e., science-based). SCCWRP scientists have contributed to a long history of debates about the effects and noneffects of specific pollutants, natural causes of changes in the health and abundance of marine life, ocean assimilative capacity, efficacy of advanced treatment and source control, and management of in-place sediment contamination. SCCWRP staff have disagreed among themselves about what is important and what is irrelevant. What *is* important is that those debates were based upon their continually growing understanding of coastal processes, the specific behavior of pollutants in the ocean, the ability to distinguish important from unimportant sources, and the consequences of waste management tradeoffs to the land, air, and ocean. SCCWRP has provided much of the basis for these debates and, in the process, has engendered the controversy that comes from strongly felt convictions based upon discovered truths (Isaacs 1978, Anderson 1988).

A cleaner coast, with respect to contaminants, does not mean that conditions have improved for coastal uses or fish, shellfish, and wildlife populations. Other factors, both natural and human-induced, have conspired to affect public health and marine populations in ways that are far from simple to understand. For example, more marine mammals populate the Bight than at any time in the last century, but many coastal rockfish populations are depressed. Oversimplifying the apparent connection between these potential predators and prey risks great hazard. While contaminants may play a lesser role, other influences continue to threaten the marine environment. Where are the bacteria coming from that continue to cause public beach closures? Are sources or transport phenomena being overlooked? What are the tradeoffs of moving wastewater solids inland? Much has yet to be done to understand the combined roles of climate change, surface water management, resource management, and contaminants so that future decision-makers can evaluate alternatives and take actions based upon understanding. SCCWRP's role in that future cannot

be predicted, but we believe it is vital to assist national decision-making.

As a result of continued support, freedom of research, and increased coordination, SCCWRP has been privileged, within its mission, to provide a sound basis for understanding the ecology of the Southern California Bight and the role played by the human element. By testing and challenging hypotheses, maintaining a regional view, and working directly with stakeholders, SCCWRP has helped Californians manage coast resources based upon understanding and not unfounded theories and speculation induced by the hysteric reaction to ecological events.

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ACKNOWLEDGEMENTS

Dr. Alan J. Mearns is Senior Staff Scientist with the Hazardous Materials Response Division of the National Oceanic and Atmospheric Administration in Seattle, Washington. Dr. Mearns joined SCCWRP in 1971 and led the SCCWRP Biology Division from 1973 to 1980. Dr. M. James Allen is head of SCCWRP's Fish Biology Department (working at SCCWRP from 1971 to 1977 and from 1993 to present), and Michael D. Moore is the Manager of the Environmental Compliance and Monitoring Division, Technical Services Department, of Orange County Sanitation District (OCS D) and is an Alternate Commissioner on the SCCWRP Commission. Mike worked for SCCWRP from 1974 through 1984 as a biological oceanographer and fisheries biologist.

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The opinions expressed here are those of the authors and not necessarily of NOAA, OCSA, or SCCWRP.



From left:

Dr. Alan J. Mearns
National Oceanic & Atmospheric Administration,
Seattle, WA

Dr. M. James Allen
Southern California Coastal
Water Research Project
Westminster, CA



Michael D. Moore
Orange County Sanitation
District, Fountain Valley, CA

APPENDIX 1.

Commissioners and Alternate Commissioners for the Southern California Coastal Water Research Project, 1969-2000.

Agency Commissioner	Term	
	Commissioner	Alternate
City of Los Angeles		
Timberlake, L. E.	1969-1972	
Barhydt, Janet Bell —Garber, Janet Bell (Barhydt)	1972-1977(B); 1977-1990 (G)	
Biagi, Delwin A.	1990-1996	
Sones, Drew	1996-1997	
Wilson, Judith	1997-present	
Peterson, William S.		1969-1979
Zoeger, John E.		1979-1990
Alpern, Robert Alpern		1990-1993
Cheng, Ing-Yih Samuel		1993-1994, 1996-present
Miller, Michael		1994-1996
County Sanitation Districts of Orange County (1969-1998)		
Orange County Sanitation District (1999-present)		
Parsons, Lindsley	1969-1979	1979-1981
Sharp, James B.	1979-1985	1976-1979
Edgar, Richard B.	1985-1990	
Sylvester, J. Wayne	1990-1994	
Anderson, Blake P.	1994-1998	1990-1994
Ghirelli, Robert P.	1998-present	
Miller, Clifton C.		1969-1973
Duke, Henry H.		1973-1975
Callahan, Michael J.		1975-1976
Fox, Donald		1981-1983
Griffin, Donald R.		1983-1985
Neal, James E.		1985-1990
Torres, Ed		1994
Nellor, Margaret		1995
Wheatley, Nancy		1995-1998
Moore, Michael D.		1998-present
City of San Diego		
Cobb, Helen	1969-1971	
Martinet, Bob	1971-1976	1969-1971; 1976-79
O'Connor, Maureen	1976-1979	1972-1976
Dodson, Roy E.	1979-1985	
King, Richard	1985-1987	
Frautschy, Jeffrey D.	1987-1990	
Langworthy, Alan C.	1990-1992, 1994-present	
Mills, Milon, Jr.	1992-1994	
Dietz, Joseph F.		1979-1990
County Sanitation District of Los Angeles County		
Bond, Bert	C 1969-1979	
Carry, Charles W.	C 1990-2000	
Edgerton, Wallace W.	C 1979-1990	
Horvath, Robert W.		A 1999-present
Miele, Robert		A 1990-1999
Quinn, T. D'Arcy		A 1969-1990

Appendix 1 (continued)

Agency	Term	
	Commissioner	Alternate
City of Ventura (1969-1975)/Ventura Regional County Sanitation District (1975-1986)		
Laubacher, Thomas E.	1969-1972	
Jewett, Franklin R.	1972-1975	1972; 1975-1977
Miller, Donald H.	1975-1979	
Maland, Leslie H.	1979-1981, 1983-1986	1977-1979
Melton, John A. F.	1981-1983	
Robinson, H. F.		1969-1972
Flynn, John K.		1972-1975, 1983-1986
Eaton, David R.		1979-1981
Wright, Dorill B.		1981-1983
City of Oxnard		
Johs, Ann	1986-1990	
Maron, Dorothy		1986-1987
Nanson, Timothy P.		1987-1990
United States Environmental Protection Agency		
Barsamian, Loretta	1990-1992	
Seraydarian, Harry	1992-1995	
Hashimoto, Janet		1990-present
State Water Resources Control Board		
Anton, Edward	1990-1991	
Diaz, Jesse M.	1991-1992; 1994-1998	1993-1994
Pettit, Walt	1992-1994	
Martinson, Stan	1998-present	1996-1998
Bennett, James		1990-1991
Cohen, D		1991-1993
Wasserman, Kurt		1994-1995
Los Angeles Regional Water Quality Control Board		
Ghirelli, Robert, Dr.	1990-1996	
Dickerson, Dennis	1997-present	
Harris, Richard A.		1993-1994
Tyrrell, Catherine		1994-1998
Smith, Deborah		1999-present

APPENDIX 2.

Scientific Consulting Board members for the Southern California Coastal Water Research Project, 1969-2000.

Position

Scientific Consulting Board Member	Term	Expertise	Organization
Position A			
Isaacs, John D., Ph.D.	1969-1980	Mar. biol./fisheries	UCSD, Scripps Inst. Of Ocean.
Lasker, Reuben, Dr.	1980-1982	Fisheries oceanogr.	National Marine Fisheries Service
Stephens, Grover C., Dr.	1983-1985	Developmental biol.	UC Irvine
Reish, Donald J., Dr.	1985-1991	Benthic biology	Cal. State Univ. Long Beach
Luoma, Samuel, Dr.	1992-1993	Mar. chemistry	US Geological Survey
Mearns, Alan J., Dr.	1993-1994	Mar. biol./fisheries	NOAA
Position B			
Pritchard, Donald W., Dr.	1969-1979	Oceanography	Chesapeake Bay
Cox, Geraldine, Dr.	1979-1980	Chemistry	NOAA
Goldberg, Ed D., Dr.	1980-1983	Geochemistry	UCSD, Scripps Inst. Of Ocean.
Pearcy, William G., Dr.	1983-1986	Fisheries oceanogr.	Oregon State University
Castagnoli, Neal, Jr., Dr.	1986-1989	Biochemistry	UC San Francisco
Lee, Richard F.	1989-1992	Toxicology	Skidaway Inst. of Oceanography
Venkatesan, Indira, Dr.	1992-1994	Geochemistry	UCLA
Position C			
Pearson, Erman A., Dr.	1969-1979	Environ. eng.	UC Berkeley
Mitchell, Ralph, Dr.	1979-1980	Microbiology	Harvard Univ.
Goldman, Joel, Dr.	1980-1982	Environ. engin.?	Woods Hole Ocean. Inst.
Singer, Thomas P., Dr.	1982-1987	Biochemistry	UC San Francisco
Cacchione, David A.	1988-1992	Oceanography	US Geological Survey
Dickey, Tom, Dr.	1992-1994	Oceanography	Univ. of Southern California
Position D			
Ryther, John H., Dr.	1969-1979	Biol. oceanography	Woods Hole Ocean. Inst.
Dayton, Paul, Dr.	1979-1984	Biol. oceanography	UCSD, Scripps Inst. Of Ocean.
Capuzzo, Judith, Dr.	1984-1987	Biochemistry	Woods Hole Ocean. Inst.
Kaplan, Ian, Dr.	1987-1989	Geochemistry	UCLA
Varanasi, Usha	1989-1992	Aquatic toxicology	National Marine Fisheries Center
Stein, John, Dr.	1992-1994	Biochem./toxicology	National Marine Fisheries Center
Position E			
Lee, Richard K. C., Dr.	1969-1979	Public health	Univ. of Hawaii; Straub Clinic
McCarty, Perry, Dr.	1979-1986	Public health	Stanford University
Spies, Robert B., Dr.	1986-1989	Mar. biol./fisheries	UC Lawrence Livermore Nat. Lab.
Swartz, Richard C., Dr.	1989-1994	Toxicol./benthic ecol.	US Environ. Protection Agency
Rapporteur			
Reish, Donald J., Dr.	1991-1994	Benthic biology	Cal. State Univ. Long Beach

Original Alternate Members (1969b-1972)

Cramer, Fredrick K.	NOAA; NMFS
Merrell, John C., Jr.	U.S. Environ. Protection Agency
Salo, Ernest O.	Calif. Wat. Resources Contr. Bd
Swanson, R. L., Comdr.	NOAA