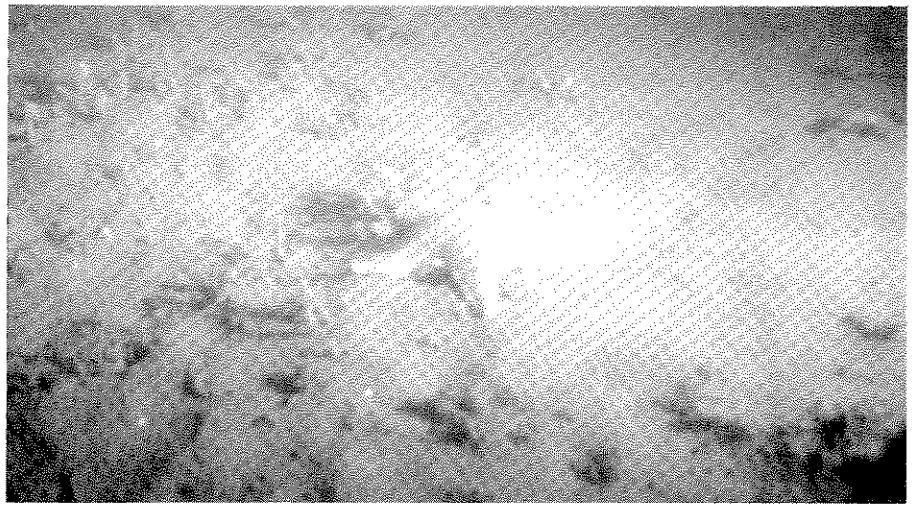

DISTRIBUTION AND ABUNDANCE OF MEGABENTHIC INVERTEBRATES IN SOUTHERN CALIFORNIA COASTAL WATERS

Although the sediment-dwelling small invertebrate animals known as the infauna have been described for the southern California nearshore shelves, slopes and basins, similar descriptions have not been done for the larger trawl-caught megabenthic invertebrates. These large, motile benthic organisms, including such members as crabs, starfish and urchins, usually are major contributors to community biomass. Also, because of their feeding and burrowing activities, they may be important in maintaining the commmunity structure of the infauna. In addition, it would be useful to know whether these larger invertebrates comprise assemblages which would be sensitive to changes in the environment associated with pollution.

Otter trawl data have been collected in this region over several decades. Most of these data have been collected by SCCWRP and the wastewater discharge agencies and form the basis for this study. Only data from trawls made using a standard 25 foot net, for 10-minute trawls, using LORAN, were included. The final data base consisted of 1168 trawls at 224 sites, at depths ranging from 10 to 915 meters, collected between 1971 and 1984 (Figure 1). Sites near outfalls and sites from relatively clean waters were included.

Bruce Thompson and his associates, Jim Laughlin and David Tsukada, analyzed these data for natural groupings among the fauna, to detect geographic patterns in terms of depth and location along the coast, and to examine any changes over time in these invertebrate groupings. Classification analysis (Clifford and Stephenson, 1975) was used by Dr. Bob Smith of EcoAnalysis, Inc., Ojai, California, to determine which sites had similar species composition and abundances. This analysis showed seven distinct megabenthic assemblages, five of which were related to depth and which remained relatively stable over the 14 years of the trawls, and two groups which showed changes in the mainland shelf assemblages for limited time periods (Table 1).

The mainland shelf assemblage (Group 3), from 10 to 137 meters, is a large heterogeneous assemblage dominated by the urchin *Lytechinus pictus* and the starfish *Astropecten verrilli*. The prawn *Sicyonia ingentis* is also very abundant but becomes dominant in the outer shelf assemblage (Group 4), at 51 to 300 meters, which contains both mainland shelf and slope species. The upper slope assemblage (Group 5), at depths of 300 to 490 meters, is dominated by urchins.

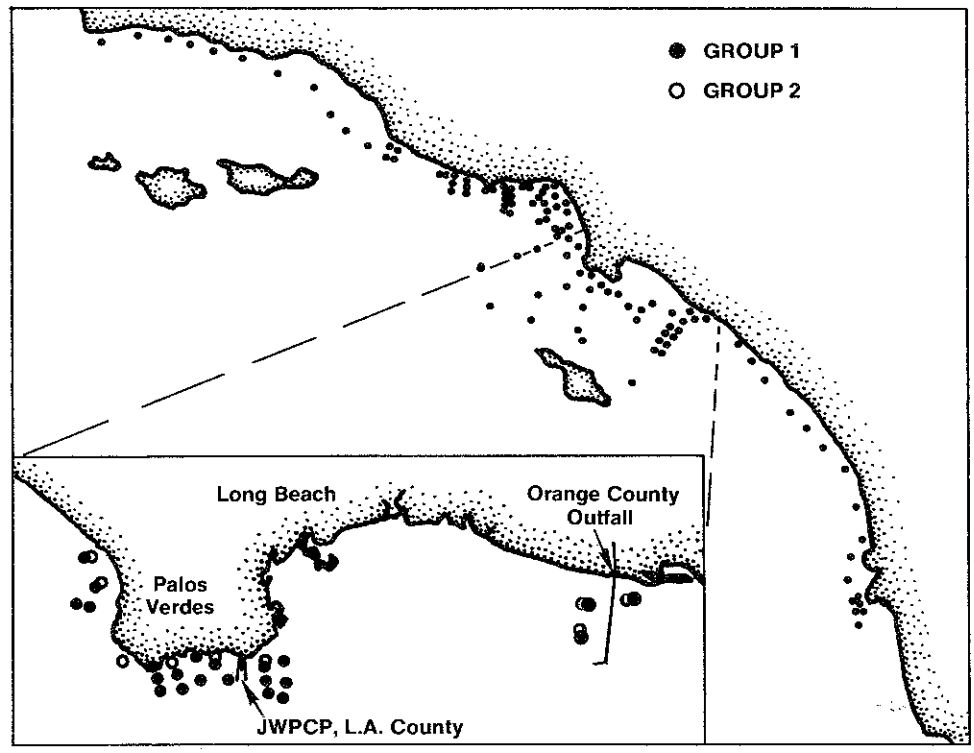

Figure 1. Collection sites. Inset shows distribution of group 1 and 2 sites.

The lower slope assemblage (Group 6) is also dominated by urchins and ophiuroids. Within the slope assemblages the urchins generally are

Classification group		1	2	3	4	5	6	7
	Area	pre-1980 Palos Verdes	post-1981 shallow	mainland shelf normal	outer mainland shelf	Upper slope	Lower slope	Basins
	Depth range (m)	23-137	18-37	10-137	45-315	300-490	478-780	715-878
Species	Taxon							
Portunus xantusii	(c)	.06 (.03)	2 (.55)	.7 (.09)	.03 (.03)	0	0	0
Astropecten verrilli	(e)	.2 (.09)	7 (.62)	39 (.79)	33 (.45)	0	0	0
Mursia gaudichaudii	(c)	5 (.59)	.07 (.03)	1 (.33)	11 (.60)	0	0	0
Pleurobranchaea calif.	(m)	3 (.47)	.03 (.03)	2 (.40)	8 (.68)	1 (.32)	0	0
Lytechinus pictus	(e)	4 (.05)	85 (.52)	414 (.45)	88 (.23)	0	0	0
Sicyonia ingentis	(c)	5 (.22)	.2 (.01)	74 (.64)	782 (.88)	0	0	0
Pleuroncodes planipes	(c)	.04 (.03)	.4 (.07)	16 (.03)	662 (.11)	0	.4 (.12)	0
Allocentrotus fragilis	(e)	0	0	.2 (.03)	83 (.36)	391 (.96)	.8 (.06)	0
Brissopsis pacifica	(e)	0	0	R	17 (.06)	3919 (1.0)	1225 (.94)	0
Laetmophilia fecundum	(e)	0	0	0	R	16 (.60)	49 (.88)	0
Ohpiomuseum jolliensis	(e)	0	0	0	0	8 (.60)	82 (.88)	0
Ophioscolex corynetes	(e)	0	0	0	0	.2 (.12)	849 (.24)	0
Porifera	(p)	+ (.03)	0	+ (.06)	+ (.02)	+ (.08)	+ (.82)	+ (.67)
Munida quadrispina	(c)	0	0	0	.2 (.02)	1 (.16)	11 (.59)	115 (.50)
Munidopsis hystrix	(c)	0	0	0	<1	0	4 (.47)	177 (.83)

Table 1. Listing of dominant species (mean number/trawl; frequency of occurrence) in each site grouping. C = crustacean, e = echinoderm, m = molluscan.

zoned over slope depth. No urchins or ophiuroids were collected from the basin floors (Group 7); instead, galatheid crabs were most abundant.

Two other groupings showed changes over time in the mainland shelf assemblage (Group 3) during specific time periods. Group 1 is a pre-1980 Palos Verdes shelf assemblage. This is a low diversity grouping that may represent a pollution tolerant grouping. The occurrence of this assemblage decreased after 1980, corresponding with decreases in mass emissions by the Los Angeles County Sanitation District. After 1980, these sites then classified with the normal shelf assemblage of Group 3.

Group 2 is a post-1981 shallow shelf assemblage (18 to 37 meters) associated with sites off Palos Verdes Peninsula and Orange County. It is also a low diversity assemblage. It is difficult to determine what factors were responsible for changes in species composition since 1981. Thompson speculates that the El Nino of 1982-83 or the severe winter storms of 1983 caused this shift in assemblage composition and structure. No physical or environmental data were analyzed to substantiate this possibility.

The total number of species, individuals and biomass in each assemblage are shown in Figure 2. All three parameters increase over slope depth, with the greatest diversity and biomass on the slopes. There is a large amount of variation in the means of the trawl data.

Of the seven groups resulting from the analysis, only Groups 1 and 2 showed large scale changes in species composition and abundance over time. In the other groups, there are undoubtedly seasonal and other short term changes in some species, but overall the assemblages appear to be stable.

This large and detailed data base will continue to be analyzed to evaluate seasonal shifts in abundance and long term population fluctuations of some of the dominant species. SCCWRP is developing bioassays using two of these species, *L. pictus* and *S. ingentis*. Information on these organisms' natural habitat and faunal associations, and changes that may occur, will be a valuable addition to the laboratory findings and will help biologists to understand better the causes of natural variation and pollution induced variation.

References

Clifford, H. T., and W. Stephenson. 1975. An introduction to numerical classification. Academic Press, New York. 229 pp.

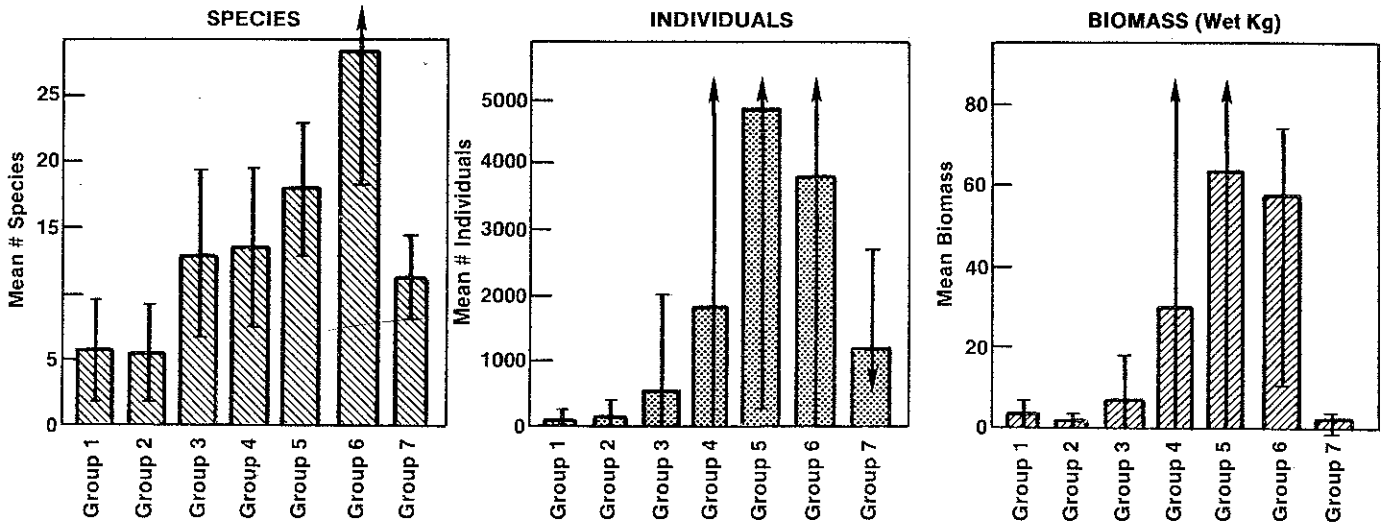

Figure 2. Comparison of total number of species, individuals, and biomass per trawl in each site grouping.