INTERTIDAL STUDY OF THE SOUTHERN CALIFORNIA BIGHT

VOLUME II

5.0 ROCKY INTERTIDAL ISLAND SURVEY

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5.0 ROCKY INTERTIDAL ISLAND SURVEY

Observations were made by helicopter overflights on representative rocky intertidal communities found on the inner and outer coast of the eight Channel Islands -- where not restricted by the presence of bird or mammal colonies -- from November 1977 through November 1978 for the northern group and from November 1977 through December 1978 for the southern group. Photographs were taken and zonal communities were recorded on tape recorder in reference to the dominant assemblages determined by cluster analysis for the high- resolution, high-intensity studies done for the 15 island sites reported in Report II-1.0, Chapters 1.1-1.22. These observations were made by cruising at approximately 40 knots, 15-30 m in altitude, with the doors of the helicopter removed for better visibility and photography. Landings were made to obtain ground truth data on nearly all accessible portions of the eight islands surveyed. In addition to the dominant zonal assemblages, the presence of sandy beaches, (light stipling) boulder beaches (circle pattern), and rocky intertidal substrates (dark shading) were mapped and quantified in considerable detail. These data were then used to map the dominant rocky intertidal communities on U.S.G.S. 7.5' quadrat (scale 1:24,000) maps. The smbols used to notate assemblages on the maps are not identical to those used in the cluster analyses of Volume II. These maps and the original field notes constitute the island survey data-base. The fact that these flights were made at low tide gives a considerably different picture of substrates than indicated on the original U.S.G.S. coastal maps. The relative proportions of sand, boulders, and rock were precisely determined with a Minerva plane measurer prior to the overlaying of pattern.

At low tide, sandy beaches on islands were found to total about 21.5% of the shoreline with the remaining 78.5% consisting of rock (of which 16.0% was boulder beach, and 62.5% solid rock substrate). The island having the highest percentage of solid rock substrate was Santa Barbara Island (73.6%), followed by Anacapa Island (70.0%), San Clemente Island (68.6%), and Santa Cruz Island (66.2%). The island having the least amount of solid rock substrate was Santa Catalina Island (35.3%). There were far more boulder beaches on Santa Catalina Island (49.5%) than on any of the other islands with Santa Barbara Island (22.2%) and San Clemente Island (17.3%) also having considerable boulder beach substrate. San Miguel Island (0.2%), San Nicolas Island (4.6%), and Santa Rosa Island (5.0%) all had very low amounts of boulder beach substrates. Islands having large percentages of sandy beach at low tide included San Miguel Island (36.1%), San Nicolas Island (34.7%), and Santa Rosa Island (33.3%). Santa Barbara Island had only 4.2% sandy beach, whereas San Clemente Island had 14.0% sandy beach, Anacapa Island, 15.2%, and Santa Catalina Island, 15.3% Table II-5.0-1 shows the absolute amount of shoreline of the various substrate types. Santa Cruz Island had the greatest total amount of solid rock intertidal substrate (83.6 km), San Clemente Island had 62.5 km. Santa Catalina Island had by far the most extensive boulder beaches, as assessed during low-tide periods, (50.2 km).

Table II-5.0-1. Absolute (km) and Relative (%) Amounts of Substrate Types Observed in the Rocky Intertidal Zone of the Channel Islands from November 1977 to Decmeber 1978.

Island Systems	Per Cent Substrate Type			Kilometers of Substrate Type		
	Rock	Boulder Beach	Sand	Rock	Boulder Beach	Sand
San Miguel Island	63.7	0.2	36.1	33.1	0.1	18.8
Santa Rosa Island	61.8	5.0	33.3	52.7	4.2	28.4
Santa Cruz Island	66.2	14.8	19.2	83.6	18.8	24.4
Anacapa Island	70.0	14.8	15.2	15.2	3.2	3.3
Santa Barbara Island	73.6	22.2	4.2	8.2	2.5	0.5
Santa Catalina Island	35.3	49.5	15.3	35.8	50.2	15.5
San Nicolas Island	60.7	4.6	34.7	25.5	1.9	14.5
San Clemente Island	68.6	17.3	14.0	62.5	15.8	12.8
Mean %	62.5	16.0	21.5			
Total km				316.6	96.7	118.2

We feel that this island survey program was a rapid, cost-effective, invaluable asset to the overall program in that we can now make the general statement that our 22 study sites are representative of major rocky intertidal ecosystems throughout the Southern California Bight. Additionally, the detailed photographs taken of these systems may prove invaluable in that they might be re-assessed quantitatively by the photographimetric method technique if environmental disturbances should occur because of the exploration for gas and oil and its development. In other words, although the present study was designed to produce qualitative information and maps of the island rocky shores, the future potential for quantifying the aerial photographs by the photographimetric method (Littler, in press) should not be overlooked.

Appendix I (Enclosure I)

Clarification of the Southern California Bight Intertidal Island Survey

Appendix II

Set of 19 Maps
(Enclosure II is a reduced copy of typical map)

Appendix III

Transcript of Field Notes

Clarification of the Southern California Bight Intertidal Island Survey Maps

An intertidal survey of the eight Southern California Bight Islands was conducted for the Bureau of Land Management by Littler and Littler (1979) between November 1977 and December 1978. The primary product was a series of 19 U.S. Geological Survey 7.5 minute quadrangle maps (scale 1:24,000) depicting the major rocky intertidal assemblages and the extent and distribution of the rocky, boulder and sandy beach intertidal habitats at low tide.

The survey was conducted from a low flying helicopter and supplemented by numerous ground truth observations. The observer's ability to identify species and recognize assemblages was also enhanced from detailed studies conducted at 15 sites located on these islands (Littler 1979).

The study was designed as a general survey, so not every habitat or assemblage was precisely denoted. Major assemblages in a region were depicted; however, variability in vertical relief and microhabitat patchiness resulted in isolated nonconformities too detailed for inclusion.

The dominant intertidal assemblages are represented on the quadrangle maps by capital letters, with a key to the most abundant species in each assemblage. Although the symbols used on these maps are similar to those used by Littler (1979), they are not always identical, so care should be used when comparing the two reports. The assemblages are given in sequence according to their vertical intertidal level with the highest assemblage at the top of the list. Actual vertical ranges may, of course, extend either higher or lower. The total of these assemblages is referred to as the assemblage list. Vertical ordering was indicated only for the main assemblage lists. The notation of species at areas that did not quite conform to the surrounding assemblage, typically where several species were unusually abundant, is not necessarily in vertical sequence.

Lines are drawn from the assemblage lists to the rocky intertidal areas where these assemblages occur along the shoreline. The extreme outer lines from each assemblage list denote the boundaries of these assemblages along the shoreline, and the rocky intertidal areas between these lines contain the same assemblages, whether denoted by another line or not, unless otherwise indicated. Typically there is more than one set of lines between an assemblage list and the adjacent shoreline. Lines other than the extreme outer lines merely serve as additional references for the assemblages. All of the taxa represented by a given assemblage list are present in the denoted area regardless of where the line from the rocky areas reaches the assemblage list.

Usually, additional subgroups shown within a larger group represent rapid changes or minor differences over short horizontal distances, whether they occur within or outside the lines used to denote a vertical sequence of assemblages. Rocky or boulder areas between two adjacent assemblage lists have species in common with these lists, whether isolated species are denoted or not, unless these isolated species are the following (alone or in combination): Ulva, Ulvalean greens, Uvales, Enteromorpha, Phyllospadix, mixed reds or Chaetomorpha. An example of the former occurs on the northern shore of Santa Catalina Island (Map 14) where abalone (H) and Mytilus-Pollicipes (C) occur in addition to the species listed on either side of this stretch of shoreline. However, an example of the latter is the boulder area to the east, where only patches of EA (Phyllospadix) occur. Other examples of the former include Anacapa Island (Map 11). The most notable are located just east of the western tip on both the north and south shores. Another is the area just south of Avalon Bay on Santa Cruz Island (Map 16) where Pelvetia is abundant.

In addition to the symbolized assemblages, there often are statements that denote localized, subtle to obvious changes of some aspect of the community. For example, when the abundance of an assemblage is other than "normal", the assemblage symbol is followed by words of further clarification. The terms rare, common, abundant, very abundant, and dominant represent various degrees of increasing cover; few, many, numerous, dense, and very dense refer to numbers of individuals; and very sparse, sparse, patches, scattered and extensive are used to describe the breadth of distribution of the various populations. The following points also need clarification:

Map 2: Northeast side of San Miguel Island, symbol "B" should be "BB" - (Pelvetia).

Map 4: North side of Santa Rosa Island (H zone), indicates that Haliotis form a distinct vertical zone.

Map 4: West of the most northeastern assemblage on the northern shore, consists of a small area with Eisenia and a "sand disturbed" rock containing primarily colonial green algae (Ulvalean Chlorophyta). This is not a transition area (see discussion below).

Map 5: South side of Santa Rosa Island - "No fucales" refers to the fucaleans Pelvetia and Hesperophycus.

Map 6: East end of Santa Rosa Island - Notice that at Skunk Point, only blue-green algae, Littorina, and Phyllospadix occurred here. This, therefore, was not a transitional area (see discussion below).

Map 7: Southwestern shore of Santa Cruz Island was an extremely

rapidly changing area with few species, not a transitional area (see discussion below). Omit "No C" at southern portion of shore.

Maps 8 & 9: "Like Willows Anchorage" refers to the intensively studied station on Santa Cruz Island's southern shore (Map 8) studied by BLM (Littler 1979).

Map 10: Eastern end of Santa Cruz Island - "Phyllospadix" occurred only on one boulder, and was absent everywhere else in this area as represented by a large semi-circle extending northwest.

Map 11: Anacapa Island - "Bossiella" and "Balanus" in the northeast, and "Fucales", "Phyllospadix", and "Endocladia" in the southeast are located on the islands nearest the lines closest to these names. Anacapa Island was difficult to observe because its high cliffs made it difficult for the helicopter to get close to the intertidal zone, and ground truth was not permitted on the majority of the island.

Map 12: San Nicolas Island just northwest of eastern tip - Three small isolated low flat rocky areas containing only Ulvalean green algae and the Mytilus - Pollicipes group.

Map 19: San Clemente Island, "All zones" - Because of sand influence, most species occurred over a wide vertical distance and did not form discrete vertical zones except at the two small locations indicated.

The assemblage GBS should be listed on the key as Halidrys, Bossiella and Strongylocentrotus sp.

Some areas are transitional between one community assemblage type and another, such as an area between an exposed point and a more protected shore 100 meters away. The difference in vertical extent of the intertidal location and patchiness caused by a variety of reasons also cause nonconformities within short distances. Some of the rocky areas show no species on them and can be considered as transitional between two adjacent assemblage types. Since these may be difficult to distinguish from areas that rapidly change species, transitional areas are noted below.

Map 3: Points on north and south of western point of Santa Rosa Island

Map 8: Southern shore of Santa Cruz Island. Although some of the different species are indicated, and there are no rocky regions without markings.

Map 10: Area with no markings to the south of the eastern tip of Santa Cruz Island.

Map 11: Several transition areas, most notably just east of the western tip of Anacapa Island on both the north and south shores.

Map 14: Northern shore of Santa Catalina Island - transitional areas with patches of abalone (H) and mussels which are absent or rare at each of the adjacent assemblage types. The symbol for abalone (H) is absent from the species key list for this map.

Map 16: Santa Catalina Island just south of Avalon Bay - transitional area with rich Pelvetia on rocks in addition to species shown at adjacent areas.

Although the assemblages of many of the boulder areas were indicated, the majority were not, because of lack of substrate stability or vertical extent. The seaward, horizontal, and vertical extents of the intertidal varied at different areas even though they are symbolized as the same on the maps. The unmarked transitional or gradation areas and rapidly changing abnormalities are a small fraction of the total area and once the map symbols are understood, the major rocky intertidal assemblages are easy to identify.

LITERATURE CITED

Littler, M. M. 1979. Assessments of overall, intersite, and site specific distribution and abundance patterns of rocky intertidal organisms in the Southern California Bight. Vol. II, Report 6.0 in the Southern California Intertidal Survey Year III. Prepared by Science Applications, Inc. for the Bureau of Land Management, Pacific OCS Office, Los Angeles, CA. Contract No. AA551-CT7-44.

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Enclosure II