SERAL COMMUNITIES OF A MUDDY SEA BOTTOM

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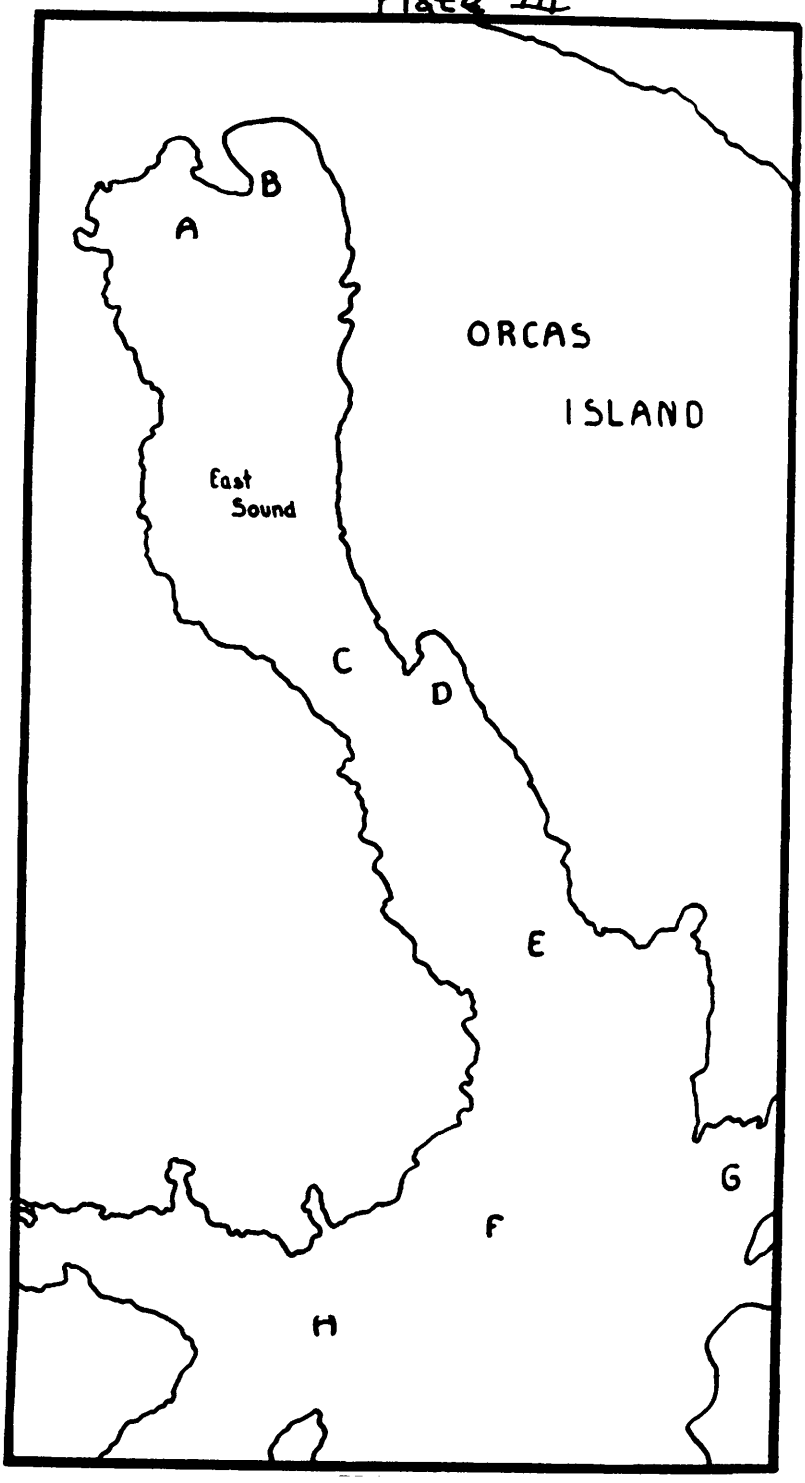
During the summer of 1929 a general survey was made of the bottom fauna of East Sound and adjacent interior waters of the San Juan island group. East sound is a long, narrow body of water extending into the south side of Orcas Island which surrounds it somewhat in the shape of a horseshoe. The length is about six miles and the average width about one mile. The shore line is rugged except at two points, where the villages of Rosario and East Sound are located. The latter is at the head of the bay and the slope is gradual from a sandy beach to an altitude of perhaps fifty feet, followed by a gradual downward slope to sea level on the north side of the island, at a distance of approximately a mile. This is the narrowest portion of the island. The depth of the sound, off shore, varies from nine to twenty-five fathoms but the greater part has a relatively uniform depth of about fifteen fathoms. The bottom material ranges from a very fine organic mud at the head of the sound to a mud having a considerable admixture of sand at the mouth. The area of investigation extended beyond the mouth to Harney channel and the western opening of Obstruction pass, in which latter locality a considerable amount of gravel was found.

The principal method of collection was the use of the Petersen bottom sampler which brings up the surface mud of the sea bottom with the contained animals from an area of 0.1 square meter. The larger, less frequent animals are not accurately represented in the catch nor are motile forms collected with any degree of quantitative accuracy. The census of the smaller sessile and inactive forms may be considered, however, as reasonably accurate.

The gradation in physical condition of the bottom was accompanied by a striking series of communities as indicated by the accompanying table giving the population per square meter at the collection station indicated in the map. Only the most numerous animals are considered and in some cases the identifications are tentative and subject to revision.

At Station A (Fishing Bay), where the mud was most dense and contained little or no sand, only two species were found, *Macoma yoldiformis* a very delicate bivalve and an annelid, *Sclerocheitus pacificus*. Neither occurred abundantly, but the former was found more consistently here than elsewhere. At Station B (Ship Bay), where the mud contained some sand, this bivalve was still found but the position of dominance was taken by another, *Phacoides tenuisculptus*. A worm, *Ammochares* sp. not found elsewhere was next in influence. More *Sclerocheilus pacificus* were also found here. Stations C and D, about halfway down the sound may be considered together as differences were relatively unimportant, but sufficient to show variations within short distances Here *Sclerocheilus pacificus* has become the most abundant form. *Amphiodia occidentalis* a serpent star which was present in small numbers at Station B became especially abundant at Station C, falling off again at D. *Phacoides* was still present but its position of predom-

Plate III



inance was taken by another bivalve, *Pandora filosa*. All of these forms were still present at Station E, and all but *Sclerocheilus* at Station F. The latter, however, was found again at more distant stations. The most abundant form at these two stations was the holothurian *Cucumaria populifera* of which enormous numbers were found. Most of these cucumbers, however, were juveniles and the numbers in the table give perhaps, an erroneous idea of their relative importance. *Sternaspis fossor* present since Station B, became very important here also. Station G does not really belong in this series as the bottom was of gravel, shell and mud and marked transition to more stable bottom. Most of the mud forms, however, were present. The most abundant animal, however, was the slipper shell *Colytraea fastigata* which is an attached form. At Station H, *Sternaspis* was still important, while *Amphiodia, Sclerocheilus, Yoldia,* and *Cucumaria* were also present.

On the basis of this preliminary examination we may provisionally designate the entire community examined as a *Sclerocheilus-Amphiodia* community. It can not be considered, in the light of present evidence, as a climax formation although it is probable that Station H may represent a something near a climax condition, what Shelford (unpublished) has called the *Pandora-Yoldia* community. Although the minor communities observed undoubtedly should be considered as seral associes, the direction of succession is by no means certain. It is probable, however, that deposition rather than erosion is going on and that the physiographic succession is here, from the sandy mud bottom toward a mud flat. In that case the seral com-

Station H	Amphiodia-Sternaspis Associes
Station E-F	Amphiodia-Cucumaria Associes
Station C-D	Sclerocheilus-Amphiodia Associes
Station B	Sclerocheilus-Ammochares Associes
Station A	Sclerocheilus-Mocoma Associes

It must, of course, be understood that these designations are tentative only, being based on a limited amount of work during one season only, and that they should be considered merely as a basis for further work.

Table 1. The Distribution of Bottom Animals in East Sound.

Station	A	B	C	D	E	F	G	H
Macoma yoldiformis	8	1	2					
Sclerocheilus pacificus	2	11	1565	1278	15		11	11
Ammochares sp.		1694						
Amphiodia occidentalis		12	143	10	25	11	18	30
Phacoides tenuisculptus		616	27	8	6	1		
Sternaspis fossor		1	1	4	26	21	1	30
Tellina sps.		1	6	4	10		1	3
Pandora filosa			116	24	18	1	6	
Yoldia sps.			5	6	8	9		11
Psephidia sps.			8		2		1	
Leptosynapta inhaerens			1	21			12	
Natica aleutica		3	4	4				
Cucumaria populifera					2034	460	4	3
Dentalium sp.		1			12	10		12
Calyptraea fastigata							42	
Lima sp.						1	2	

Fig. 1. Map Showing Location of Collecting Stations.