ZONATION INVESTIGATION STRAWBERRY HILL INTERTIDAL REGION

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INTRODUCTION

The lowest tides of the year provided an excellent opportunity for the study of an exposed rocky shore on the open coast. Strawberry Hill, located 30 miles south of Newport, was selected as the study area. At low tide basaltic fingers and channels extend for some distance out into the surf, leaving a large, rocky intertidal area with varying habitats and exposure.

STUDY AREA AND METHODS

The investigation was conducted over a two day period; June 22 and 23, 1967. Fig. 1 is a diagram representing the areas studied. The selected areas are the outermost extension of the rocky formation; consequently, they usually receive heavy wave action and are exposed to the atmosphere for only short periods of the year. On June 22, the tide level was expected to reach LLW (-2.0 ft.) at 7:27 A.M. We arrived at Area 1 at 6:40 A.M. when the water level was -1.3 ft.

Area 1 lies within the south side of a sigmoid channel with relatively vertical sides that exhibit obvious biotic zonation. The face of Area 1 has a small ledge at water level and a slight concavity extending to approximately eight feet.

Seaward winds of up to 5 knots produced 4 - 5 foot breakers, cresting approximately 75 feet out from the rocks. Waves approaching from the NW could not enter the channel directly because of the frontal rock formation, but did enter from the SE as Fig. 1 illustrates. There was gentle surging and eddying between water level and three feet in the channel. Surging by the neck near Area 1 caused a relatively bare zone on the rock ledge. There seemed to be an open connection under the ledge at the two foot level.

On the second day of the investigation, June 23, 1967, Areas 2 and 3 were thoroughly studied and a brief survey was made of Area 4. A low tide of -1.7 was calculated to have occurred at 7:30 A.M. Area 2 is directly open to wave attack. Four-foot northwesterly waves with a 7 to 8 second period produced a four-foot surge maximum. This agitation caused a thick foam within the channel. There is a high water velocity at Area 2 because of the construction of the channel, and a lower water velocity beyond the constriction in Area 3. Area 3 has an especially strong back and forth surging.

Area 4 is a circular rock formation about one foot above the low tide level. It is a very exposed area, swept by heavy surf.

The universal tide scale, on which the zero point is set equal to MLLW was used to locate the organisms on the faces. Access to the organisms was facilitated by one of

the investigators wearing a wet suit. The range of known organisms was recorded at the site and those organisms not recognized were collected and later identified in the laboratory.

STUDY OF THE BIOTA

. Tables of the organisms observed: Areas 1 and 2.

Mason and Langenhein (1957) suggest that a phenomenon need not be classed as an environmental factor unless it is "operationally significant" to the organism at some time during its life cycle. One of the aims of environmental analysis is to discover, by means of observation, analysis and experiment what these factors are.

Water velocity is the operationally significant factor of greatest variability in our study. Bernouilli's principle states that the velocity of an inelastic fluid (water) is inversely proportional to the volume of the opening (in this case width of the channel). Thus, the water velocity is greatest where the surge channel is narrowest; at the seaward opening and the construction at Area 1.

Area 1 illustrated the importance of water velocity in intertidal zonation. Postelsia palmaeformis was present only at the mouth of the channel where water velocity and turbulence was greatest. This brown algae is characteristic of the unprotected coast (Zone 4, Ricketts and Calvin) where there is maximum wave shock. Within the channel Laminaria sp. and Corallina sp. were abundant, but there was no Postelsia sp. Evidently, the Postelsia requires heavy surf while the Laminaria and Corallina survive only in areas of somewhat reduced water activity.

That zonation of sponges occurs is illustrated by a comparison of Verongia thiona (gold), Lissodendoryx noxiosa (white) and Hali chondria panacea (green). The gold sponge occurs on open areas of the highest water velocity. The white sponge is present in indentations or under recumbent algae, where velocity is decreased.

Threr were large concentrations of Halochondria panacea underneath the Phyllospadix clumps that dominated Area 2. Lissodendoryx noxiosa, Oplitospongia pennata and Flustrella cervicus were also common in this microhabitat.

Area 2 is characterized by a four foot surge; the greatest surge of any of the areas investigated. The presence of Phyllospadix reduced this turbulence and this may explain the presence of Halochondria and the other organisms.

Along Area 3 there is a rock sill a few inches below water. As previously mentioned, there is surging across this sill; where Allopora porphyra was the dominant growth. Keratose sponges (Demospongia without spicules) were present where the arch joined the wall of the channel. In this area water turbulence presumably is not as great as it is in Areas 1 and 2.

Other adaptive phenomena of obvious importance were:

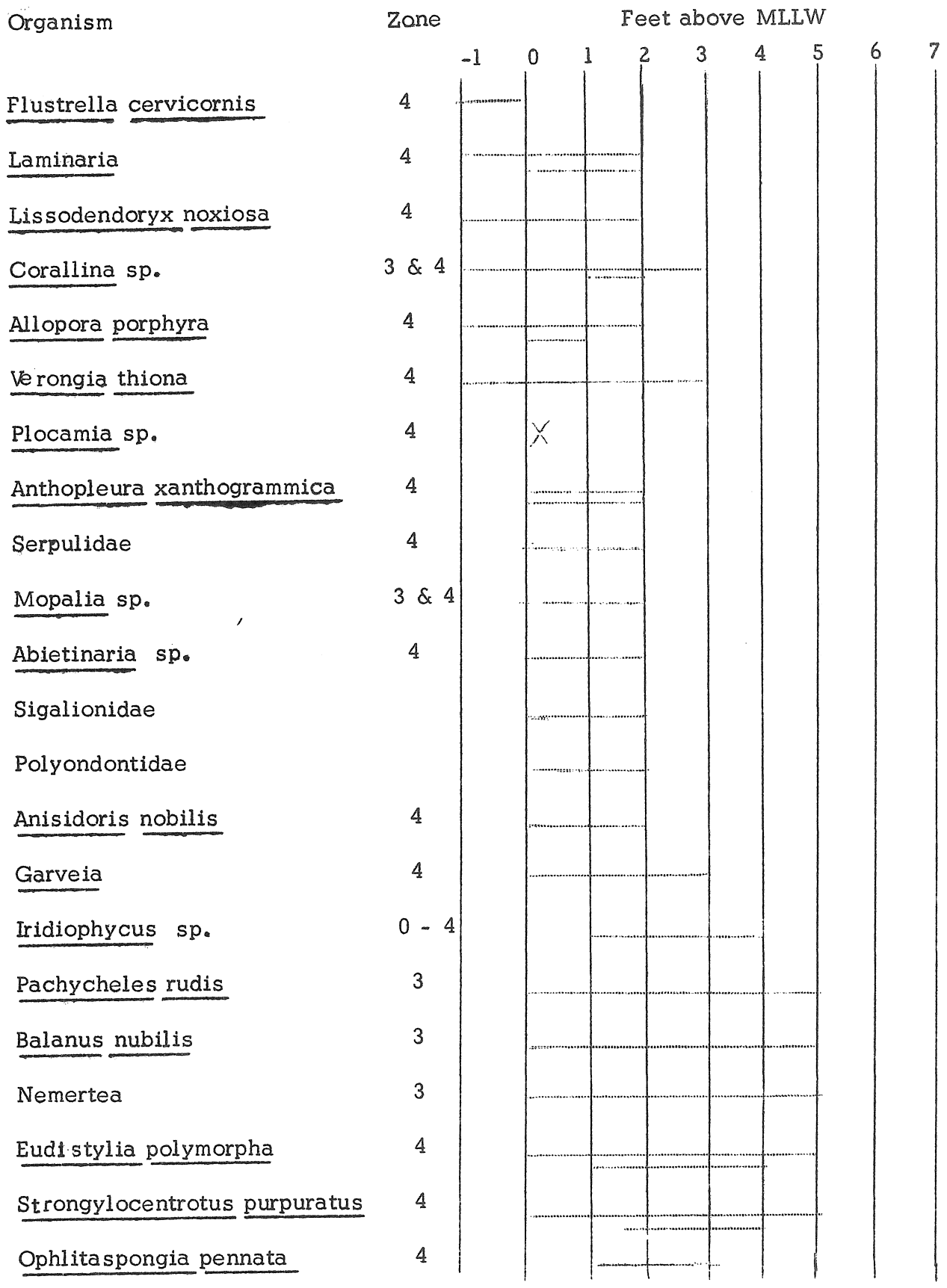
1. Disruptive coloration: Pisaster ochraceous and Tonicella lineata were dull pink with white markings which blend with the Corallina sp.

2. Microhabitat: The large algae create a microhabitat by diminishing water velocity and providing protection from desiccation and insolation. Pachycheles rudis and Halochondria panacea found refuge here. Pachycheles was also common in and around the Balanus Pachycheles was also common in and around the Balanus nubilis skeletons, as were various nemerteen worms.

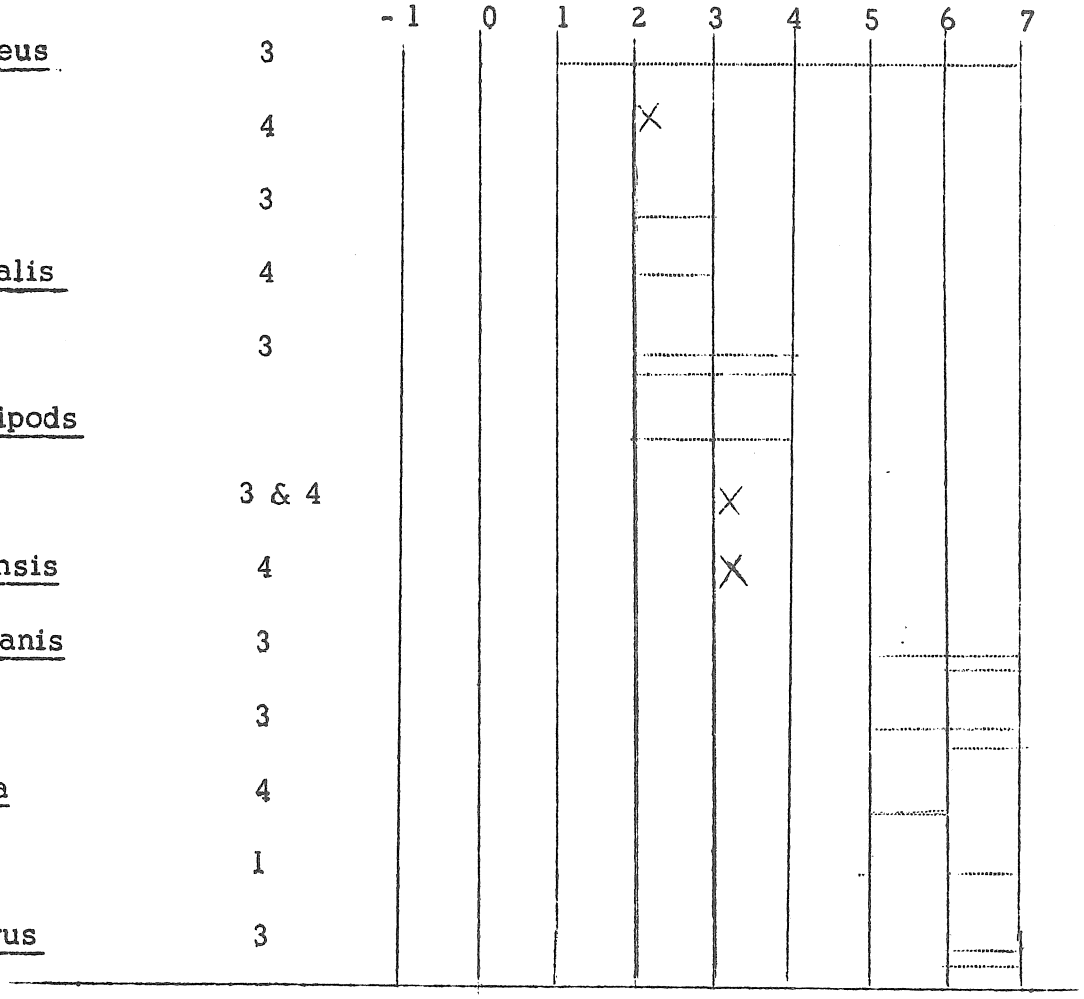
3. Holdfasts: The algae of this environment is firmly anchored by elaborate holdfasts. Animals characteristically have a clasping organ or appendages adapted for this purpose.

The observed biotic communities corresponded with the zones reported in Ricketts and Calvin. However, the surging that was characteristic of Area 1 caused the overall zonation to be elevated about three feet in the channel we studied. That is, Zone 4 organisms reported between -1.8 and 0 feet by Ricketts and Calvin consistently occurred between -1 and +2 feet in the channel; and Zone 3 organisms reported by R & C between 0 and 2.5 feet were observed between 2 and 7 feet.

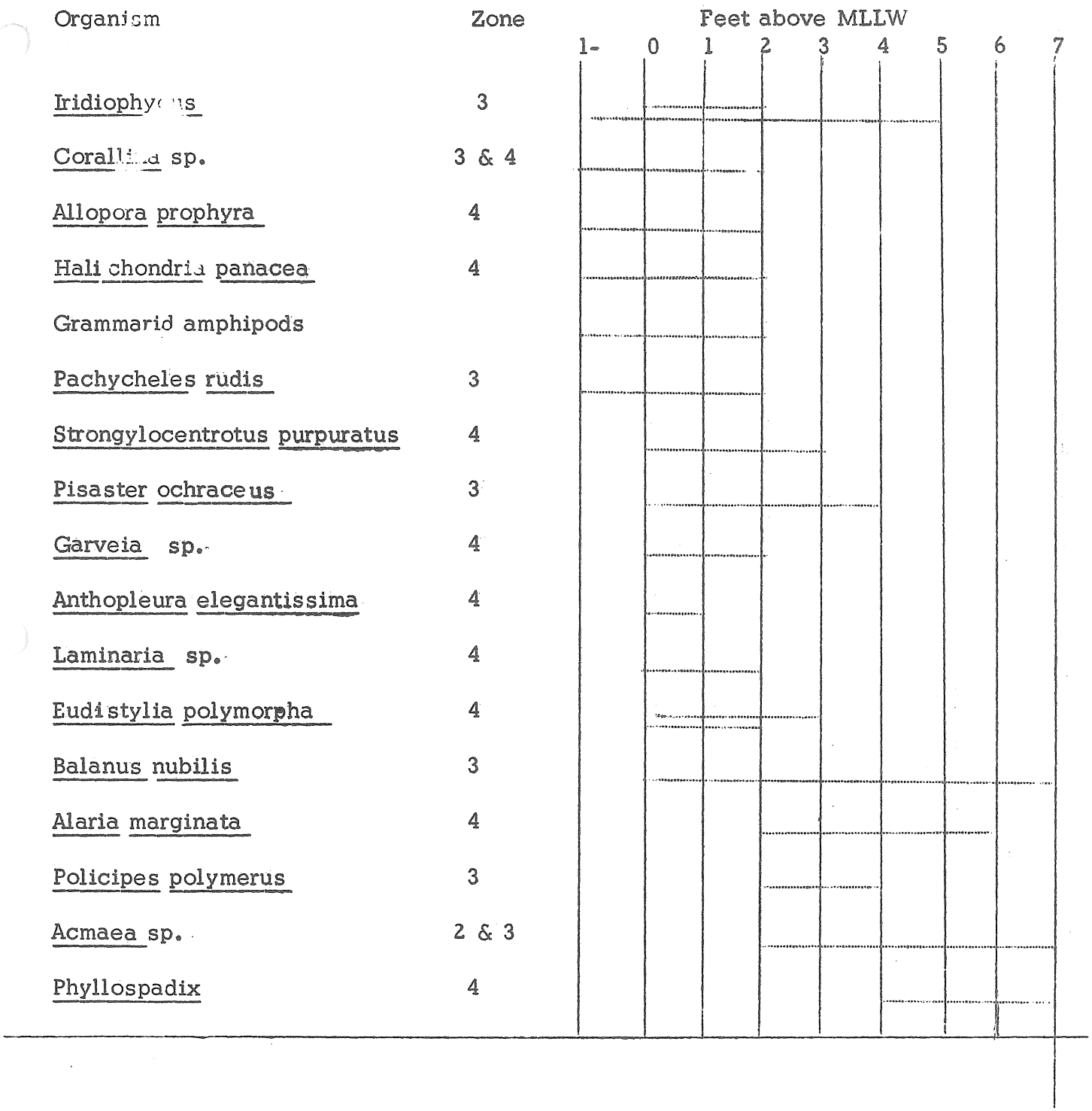
Area 1: Vertical Distribution of Organisms



Organism	Zone
Pisaster ochraeceus	3
Tealia felina	4
Tonicella lineata	3
Leptasterias aequalis	4
Ulva lettucea	3
Grammariid amphipods	
Mopalia lignosa	3 & 4
Styela montereyensis	4
Mytilus californianis	3
Mytilus edulis	3
Katharina tunicata	4
Balanus glandula	1
Pollicipes polymerus	3



Area 2: Vertical Distribution of Organisms



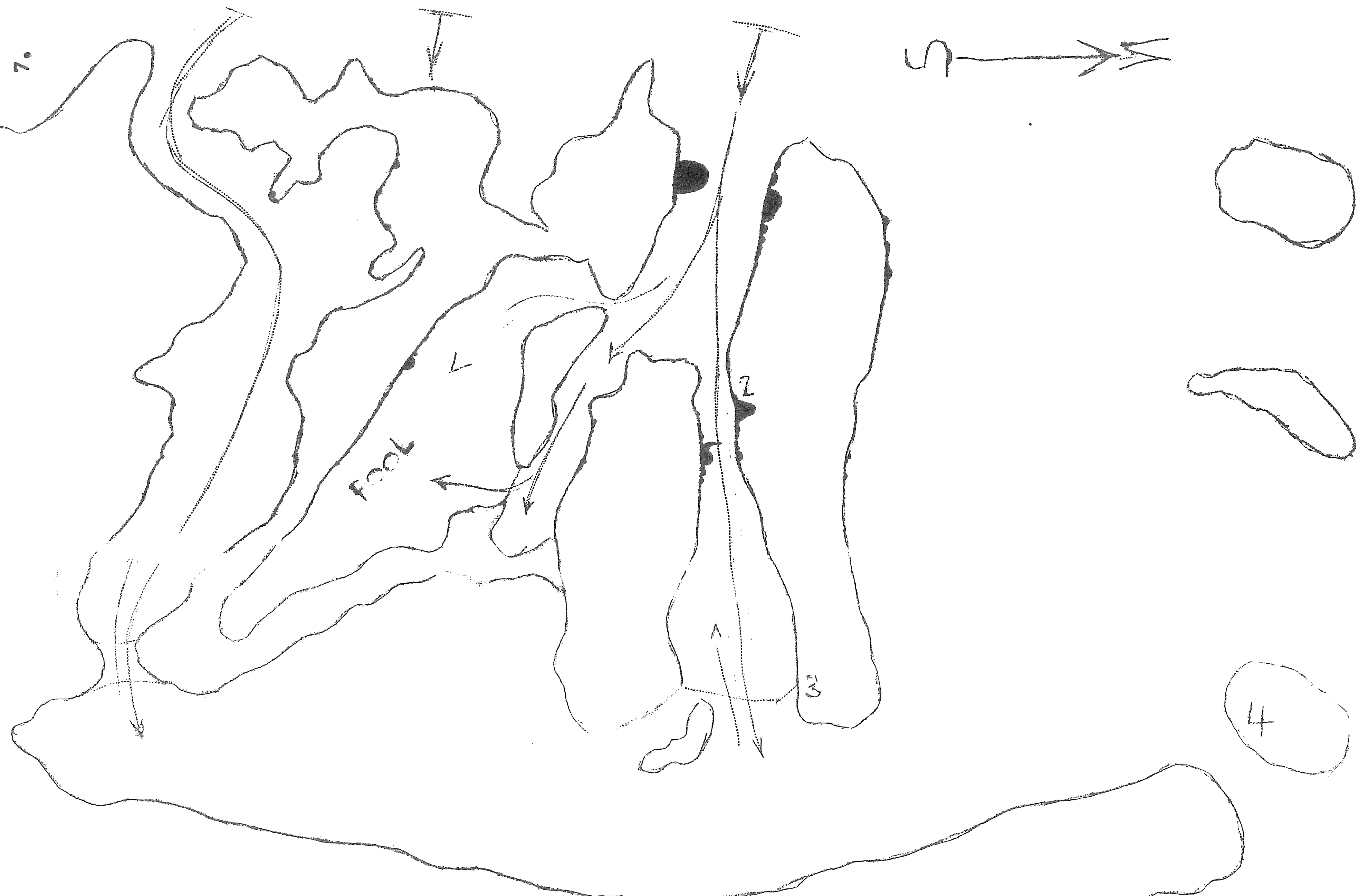


FIG. 1 EXPOSED AREA WITH ZONATION STUDIES NUMBERED. SCALE 1" = 17'.