

STUDY OF COOS HEAD PULP MILL MUD FLAT

JANUARY - MAY 1972

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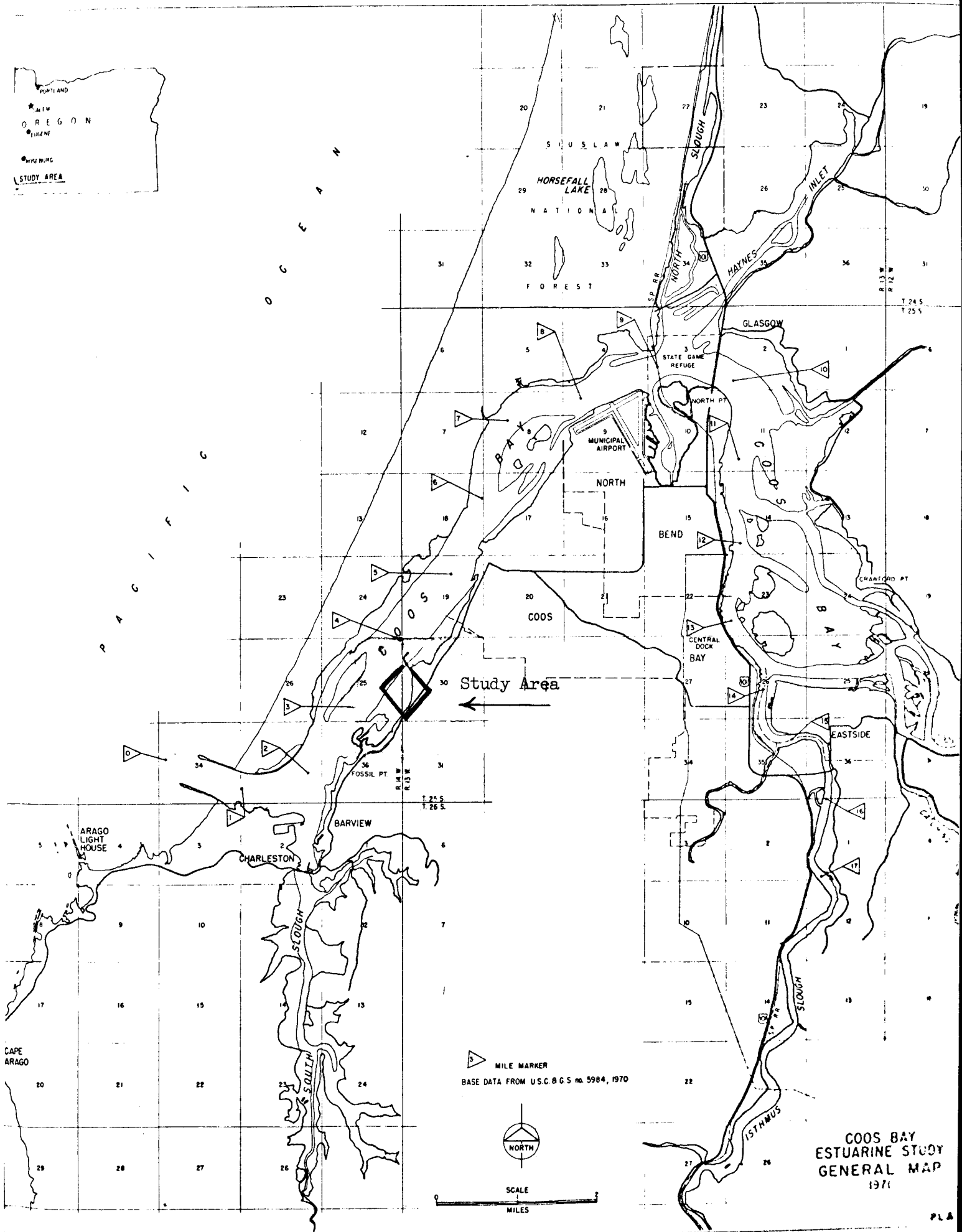
Dr. Paul P. Rudy, Director  
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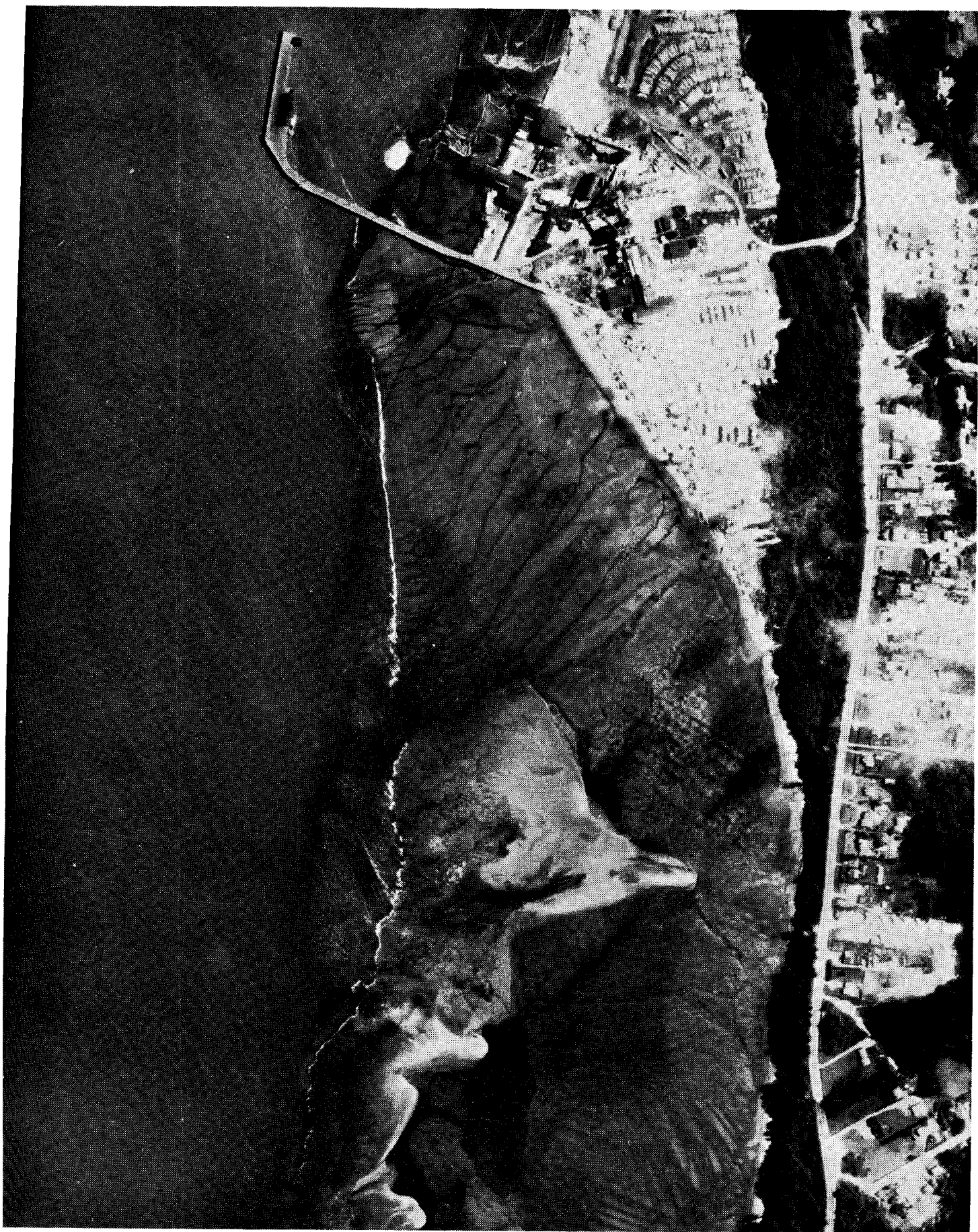


MILE MARKER  
 BASE DATA FROM U.S.C. & G.S. no. 5984, 1970



SCALE  
 0 1  
 MILES

COOS BAY  
 ESTUARINE STUDY  
 GENERAL MAP  
 1971



## Introduction

We began our study of the mudflat south of the Coos Head Pulp Mill in January, 1972, under the direction of Dr. Paul Rudy, Director of the Oregon Institute of Marine Biology. Our objective was to obtain information pertaining to the ecology of the mudflat to correlate biomass, species, substrate and elevation. A historical account is also included to give some background of the previous conditions of the area.

During the course of the study we were assisted and given help in many different areas. At this time we would like to acknowledge our thanks to Dr. Paul Rudy, for his assistance in the study; Dr. Bayard McConnaughey and Dr. Macnab for helpful information; Mr. Wiley Smith, Owner of Coos Head Pulp Mill, and C. Dale Snow, Fish Commission of Oregon, for history of the mill.

## History

The Sitka Spruce and Paper Company built the Coos Head Pulp Mill in 1928 and 1929. After a short period, the depression and market conditions of the early thirties caused the closure of the mill. Coos Bay Pulp Corporation purchased and opened the mill in 1935. Five years later, Scott Paper Company, Philadelphia, Pennsylvania operated the mill until selling it to Coos Head Timber Company in 1962. Only temporary shut downs occurred due to market conditions until the final shutdown April 23, 1971.

According to the study done by J. A. Macnab in 1964, the mill was an unbleached sulfite mill using wood chips for its cooker. The pulp was processed by the "Sudermaster Analysis", calling for approximately one-and-a-half million gallons of fresh water daily seven days a week. Every four hours while the mill was in operation, Sulfite Waste Liquor was emptied from the digesters, capacity being 35,000 gallons, for fifteen minutes. The study by Denis Cunningham in 1969 found the SWL was diluted with salt water to an approximate one-to-ten ratio before its discharge. "At the pipe pH was 3.3. Two or three-hundred yards south, pH was 6.8. The red sulphite liquor seen wafing down the tide near the mill had a pH range of 4.5 to 4.9." (Cunningham p.1)

Once dumped the discharge could not be totally buffered by the salt water due to the existing Spoil Island. This island is built from dredgings by the U.S. Army Corps of Engineers. "The result seems to be that an ebbing tide carries pulp mill waste down the bay along the mud flats behind the spoil areas. When the tide again begins to flow, pulp mill wastes which have not been flushed off the mud flats are again carried up the bay over

the mud flats toward the mill. Thus there is a sort of washing back and forth of pulp mill wastes which are never flushed entirely out into the bay." (Macnab p. 19) Even at high tide it was found that the water covering the mud flats was mixed with wood fibers.

These conditions have a direct effect on the habitat of the area. Conditions of gaper clam populations were surveyed during a period from 1965 to 1967. The Shellfish Investigations Progress Report No. 37 cites increases in populations of gaper clams in all areas except the mud flats adjacent to the mill. The 0.04 clams per square foot reading of 1963 dropped to 0.03 in 1965. "This clam bed is characterized by a foul odor and brown colored water from the adjacent mill, and continues to amaze staff members by the fact that clams are even able to survive under such conditions." (SIPR no. 37). In the report for April 1, 1966 through March 31, 1967, the population by the mill continued to decline. An interview for Macnab's study further illustrates these conditions:

"A man to whom Dale Long (research assistant for the study) talked, who was digging for clams on one of the spoil islands, stated that since the mill had been built there were very few clams left. According to L.C. Peterson, a local crab fisherman, there used to be a small sea food store along the road above these mud flats before the pulp mill was built. The owner of this store made his living selling clams he had gathered from this beach. Since the pulp mill was built he has had to close his store. It would certainly not be possible to harvest enough clams from this beach now to support such a business."

The mill closed in 1971 during one of the periodic depressions of the pulp market. It was during one of these shut downs that the Oregon Department of Environmental Quality stated that two specific improvements would have to be done to the mill before they would allow its reopening. There was



to be an ocean outfall line connection and within three years, complete chemical recovery and secondary treatment of the mill effluent were being required. The owners did not believe these requirements to be economically feasible for the small capacity pulp operation and the closure of the mill followed.

## Transit

The study area was divided into 100' square areas, the demarkation lines being layed out perpendicular and parallel to the dock.

The origin (0,0 on the map) was located twelve inches from one of the telephone poles that run next to and parallel to Sitka Dock. The origin pole is the fourth pole in the line, running from the mill toward the channel. At the time of study, it could also be sighted as the first pole past the wrack line (looking out toward the channel from the wrackline).

Another way of locating the origin is by placing a transit at the row of mailboxes on the highway directly above the Spoil Island. The pole is in a line  $11^{\circ}95'$  NNW. (see map)

The pole is marked by a yellow spot of paint, and an 8 x 8 x 16 cement block has been placed at the origin. Some digging may be required to find the brick, as the shifting sand had covered it seven inches between January and May. A mark has been etched in the brick, indicating the exact point of the plumb-line drop from the transit.

With the transit located at this position, a reading of  $57^{\circ}$  NNW was taken parallel to the dock (looking out to the channel). The line perpendicular to this,  $33^{\circ}$  SSW looking out across the study area, served as the 0 line (see map). Stakes were driven every 100', along these two transit lines, using a 100' piece of nylon rope for measuring each section.

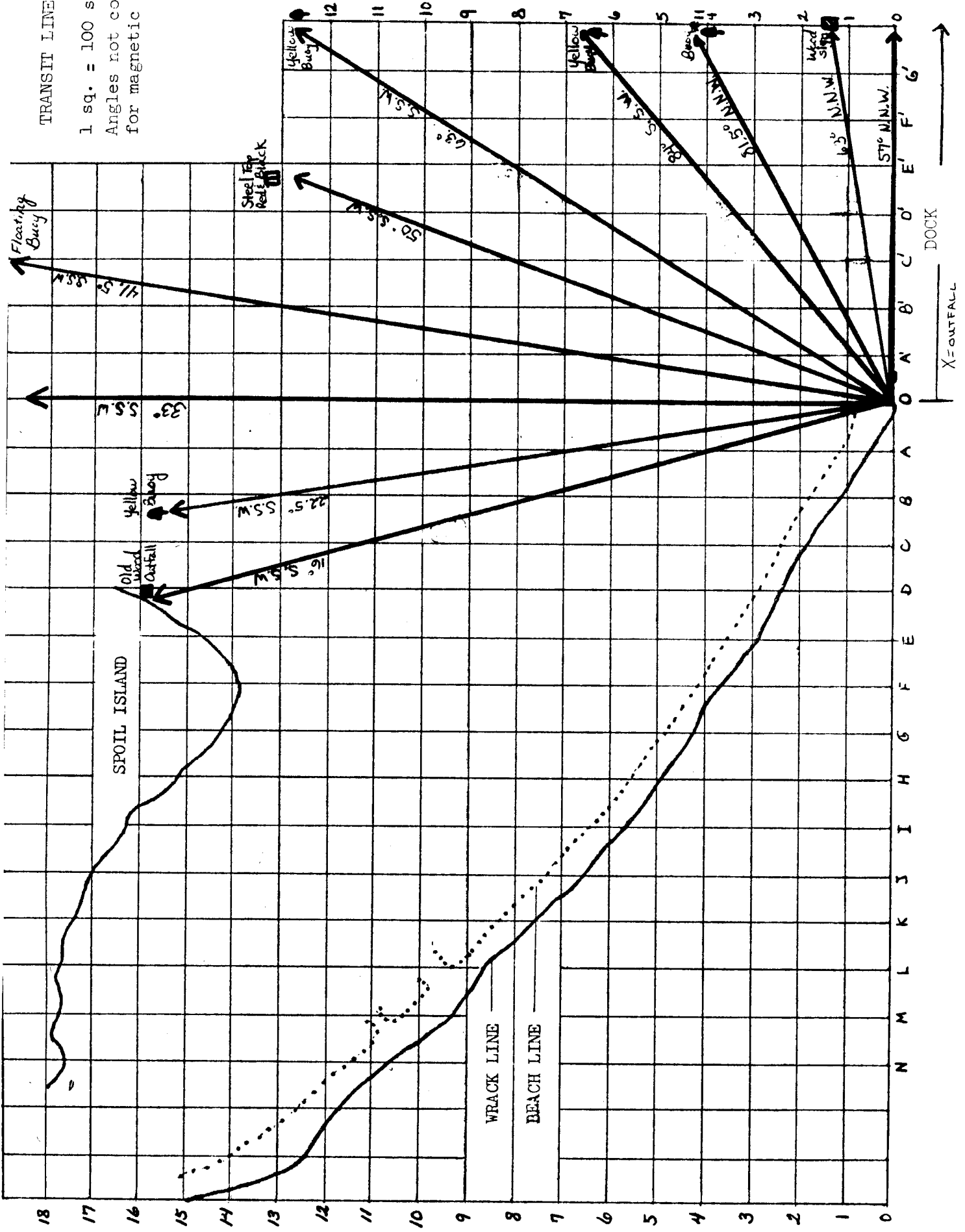
Again from the origin, two lines were measured which bisected the two

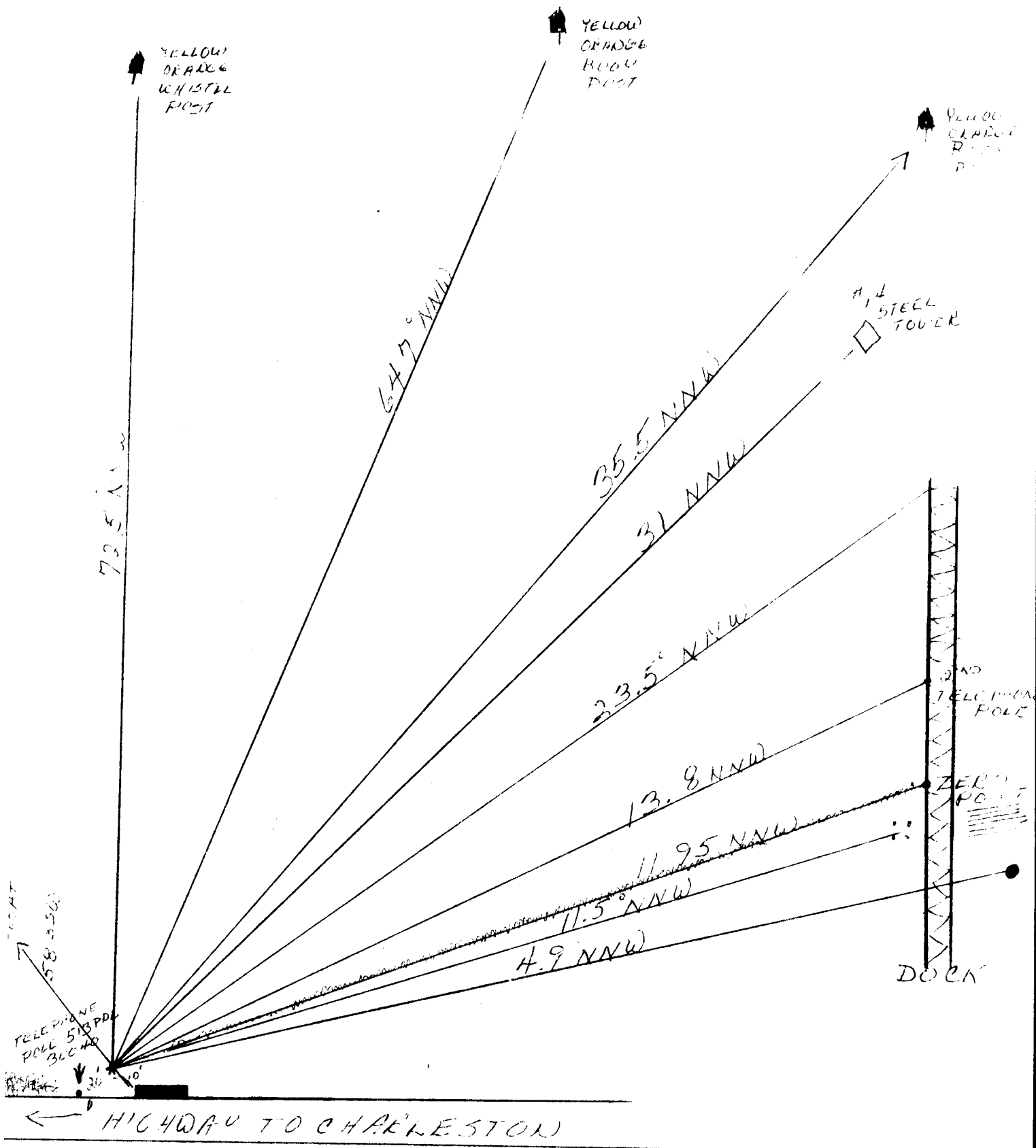
90° angles which had been formed by the transit line parallel to the dock and the 0 line. Stakes were then placed along these two lines at 147'5" (the diagonal of a 100' square) using the same measuring technique.

By using these four transit lines as a base, the remaining areas were staked out in 100' squares, using the 100' nylon rope and "eyeballing" along the permanent transit lines to keep the areas running parallel to the dock. Most of the stakes that were used to mark off the areas have remained throughout the study. The remaining stakes have been driven on into the mud in hopes that they might someday be relocated by anyone who may study this area in the future. The stakes vary in size, some being 2 x 2's, some 2 x 4's, and some are pieces of driftwood taken from the wrack line.

TRANSIT LINES

1 sq. = 100 sq. feet  
 Angles not corrected  
 for magnetic north





Angles not corrected for magnetic north

### Elevation of Mud Flat

An estimate of the elevation was undertaken to determine the general topography of the area. Information about the relative slopes was recorded to gain more insight into the dynamics of the Coos Head mud flat.

At a 0.0' tide a marked rule was placed at the ebb of the incoming water's edges to give a base line for the determination of elevations. At various time intervals the incoming water's edge was marked on the map and relative changes in height were noted from the marked rule.

A change of approximately 50 inches was noted from the 0.0' line to the area near the beach line (see elevation map). The area demonstrated various degrees of slope. The steepest slope appeared generally in the pier region. The map shows the general outline of the relative elevation changes.

The area has numerous tide pools, especially around the Spoil Island area, which are not noted on the map. The area has instances of shallow fingerlike depressions extending toward the channel which were for the most part not noted on the map. The largest of these fingers appears to run along the north-east edge of Spoil Island around F-1400.

The Spoil Island noted on the map changes shape and elevation throughout the year. General changes were observed but no quantitative data were obtained. This change in shape may be due to the influence of tide and river currents as well as wind currents.

It was noted during a period between January and May that the area at 0.0' had a seven inch elevation increase. It is suspected that this rise in elevation is a seasonal oscillation.

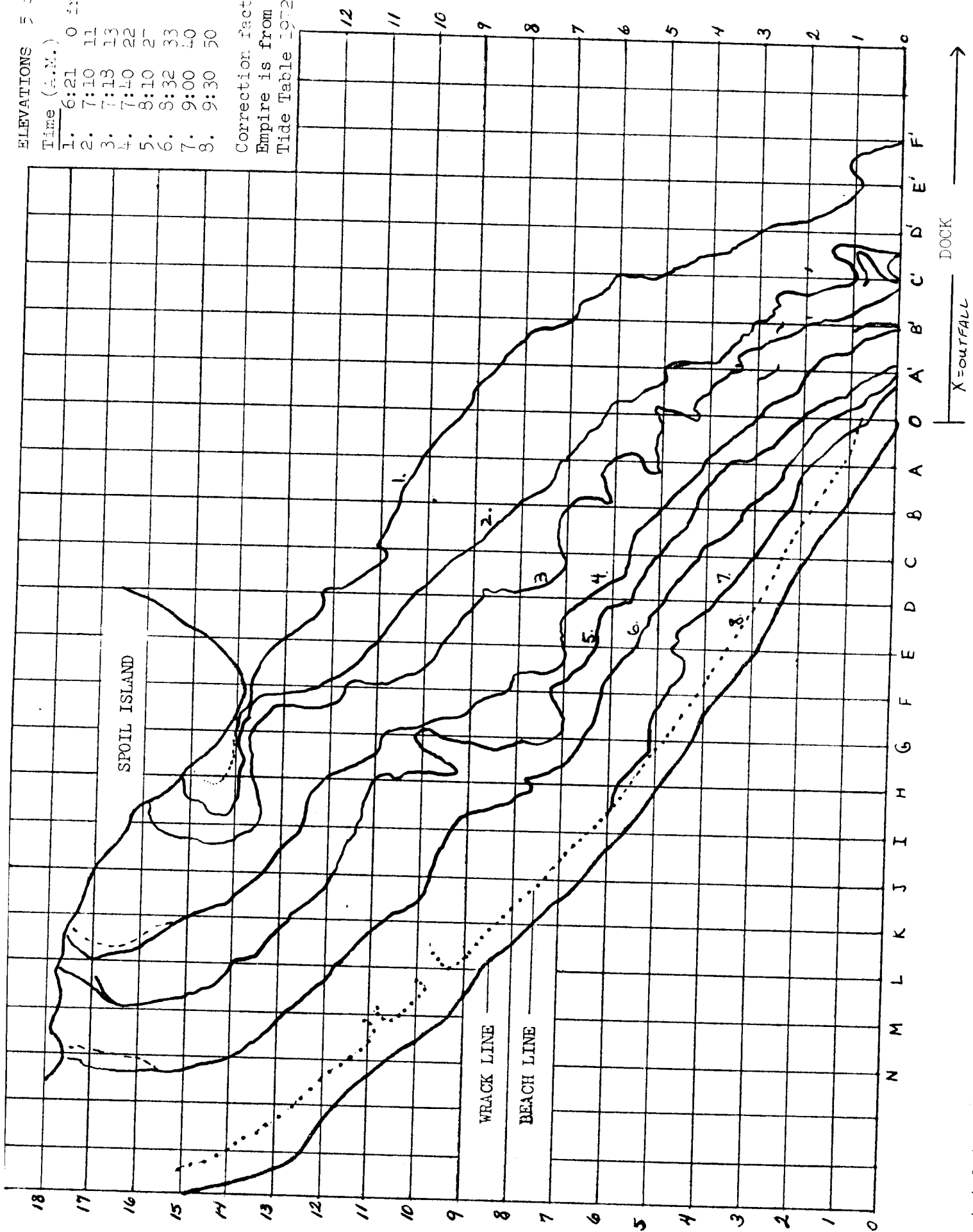
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ELEVATIONS 5 - 72

Time (A.M.)

- 1. 6:21 0 inches
- 2. 7:10 11
- 3. 7:18 13
- 4. 7:40 22
- 5. 8:10 27
- 6. 8:32 33
- 7. 9:00 40
- 8. 9:30 50

Correction factor for  
Empire is from Astoria  
Tide Table 1972



SPOIL ISLAND

WRACK LINE

BEACH LINE

X=OUTFALL DOCK



## Substrate

An analysis of the substrate south of Coos Head Mill was performed to determine the qualities of the inorganic particulate matter. The purpose of the analysis was to give general information as to the consistency of the substrate in the area.

Samples were taken every one hundred feet from the rack line going out approximately nine hundred feet towards the middle of the channel. The samples covered an area from the pier and down along the rack line every two hundred feet. (along lettered coordinates - see map). Observations were made on samples examined from the surface to a depth of approximately eight inches. Stratification was noted only if the upper layer was at least one inch in depth.

In order to discriminate between differences in the size of the particulate matter, arbitrary units of "sandy, muddy sand, sandy mud, and muddy" were set up; the size of the unit obviously descending in magnitude from sandy, the largest, to muddy, the smallest. In order to give the proper unit to the sample, if the sample would clump together it was noted as containing some degree of mud.

It was found that the substrate at the rack line consisted predominantly of sand. The tide line was also mainly of a sandy consistency. Generally, the substrate became more muddy as one proceeded out towards the channel. It was found that certain portions of the area had a distinct upper and lower layer. The stratification appeared to be most concentrated in the E to J areas (see map). Areas with a muddier upper layer appeared to be

clumped together. The stratification may be due to an influx of mud from the river. The current may be influenced by Spoil Island, thus a possible explanation of the "clumping" phenomenon. Or possibly, the stratification may be due to an outflow of mud from the land. However, this latter hypothesis is not well supported by the data. As seen on the map at the two main fresh water runoffs, the substrate is mainly of a sandy nature. In any case, the stratified areas may be loosely correlated with the eel grass beds. The eel grass may tend to hold the smaller, lighter particulate matter in place; thus keeping it from being washed away. In all the other areas noted on the map, the substrate was basically the same consistency throughout. It was also seen that during a five month period the elevation of the sand on the wrack line and at the pier increased by approximately seven inches in depth. The angle of inclination from the tide and wrack line became steeper over a five month period. The distance between the tide and wrack line also decreased somewhat. At the 0,0 point an increase in elevation of seven inches was noted after a five month period. This increase in elevation may be due to the influences of tidal, current, and wind forces.

It must be noted here that Spoil Island changes shape and position through the year. This change in Spoil Island may be due to tide and current forces.



### Methods of Sampling

In order to establish what organisms were living within the study area, and to obtain an idea of each organism's distribution and population, two different methods were utilized. The first method involved examining the surface for evidence of life. In the second method, core samples were taken throughout the area to obtain more comprehensive information on the organisms inhabiting the sand and mud.

In examining the surface area for evidence of life, individual maps of each 100 square foot area were made. From these maps the distribution and abundance of three organisms have been established: (1) Eel grass, (2) Abarenicola (3) Callianassa californiensis (see maps). The eel grass was mapped according to the percent cover of each 100 foot square area. The Abarenicola and Callianassa were mapped by counting the number of mounds and holes sighted in each 100 foot square area.

All other data pertaining to organisms were obtained by taking core samples throughout the area. The cores were taken every 50 feet on each transit line until 400' out from the dock, and then every 100' continuing out to the Spoil Island or until the water in the channel was reached. The first 400 feet from the dock was examined more closely because this area was reported to be almost completely void of organisms in Cunningham's study in 1969.

Each core sample consisted of a three pound coffee can, (diameter 5-7/8", height 6-3/8") which held 2925.0 cc of material. The can was constructed with a handle, a small hole was placed in the can's top so it could be used like a clam gun. It was thought that by using this size of core the

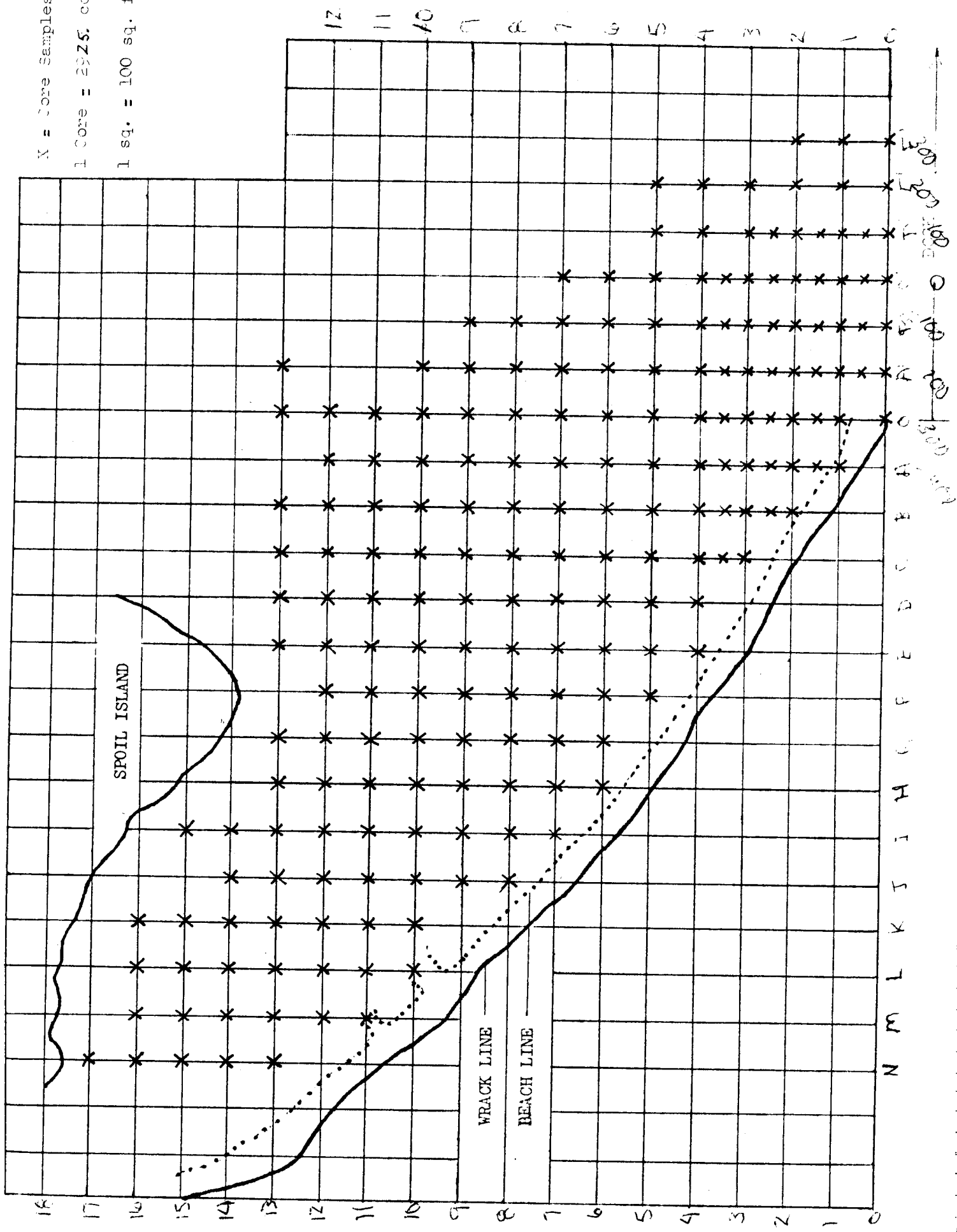
major amount of biomass present would be obtained, yet still allow a large number of samples to be taken. Each core was taken back to the Oregon Institute of Marine Biology and sifted through five screens, the smallest being .96 mm in mesh. The screens were examined for animals and those found were saved for biomass weight and identification. The biomass measurements for each sample have been wet weight, with the clams still in their shell. The animals were identified to genus and species whenever possible. The distribution and abundance of the major organisms found are shown on organism maps. Several specimens of most organisms have been preserved for future reference.

All samples contained some amount of wood chips, although the amount varied greatly over the study area. Cores with wood chip content that would amount to less than 3 grams was considered negligible and was not kept. All other wood chips from the samples were collected and their dry weight recorded.

X = Core Samples Taken

1 Core = 2925 cc.

1 sq. = 100 sq. feet





SPECIES	BIOMASS	WOOD CHIPS	AREA	
			A	B
<i>Melaleuca</i> 4		3		
<i>Zaccaria hasuata</i> 1	81.52		A' 300	
	124.54		A' 350	
	175.14		A' 400	
	119.17		A' 500	
	225.06		A' 600	
	70.13		A' 700	
	56.14		A' 800	
	15.28		A' 900	
	748.55		A' 1000	
	233.0		O	
	121		O	
	9.6		O	
	518.53		O	
	3.57		O	
	77.19		O	
	828.13		O	
	8.77		O	
	14.55		O	
	0.72		O	
	868.14		O	
	818.17		O	
	12.48		O	
	56.46		O	
	3.72		O	
	28.07		O	
	36.16		O	
	8.7		O	
	17.0		A	
	155.09		A	
	145.10		A	
	23.17		A	
	.05		A	
	78.57		A	
	71.19		A	
	0.23		A	
	58.29		A	
	0.43		A	
	164.42		A	
	9.4		A	
	0.28		A	
	0.14		A	
	5.3		A	
	29.07		B	
	385.30		B	
	2.4		B	
	11.6		B	
	11.3		B	
	0.28		B	
	0.24		B	
	0.23		B	
<i>TELLINA SALICORNIA</i> 7				
<i>TELLINA BUTTONI</i> 7				
<i>CLINOCARDIUM KITALEI</i> 8				
<i>MYA AREKARIA</i> 9				
<i>CRYPTOMYA CALIFORNICA</i> 10				
<i>PHALINE</i> SP. 11				
<i>MYTILUS EDULIS</i> 12				
<i>Polychaeta</i> 13				
<i>STONE PACTEKIA</i> 14	1			
<i>GLYCNIDE</i> 15	1 3 1 1			
<i>NERINE CIRRIATULUS</i> 16	2 2			
<i>Capitella capitata</i> 17				
<i>ASARENICOLA PACIFICA</i> 18				
<i>HESPERONOE CAMPANATHA</i> 19				
<i>EUNERESIS</i> SP. 20				
<i>NEREIS</i> SP. 21				
<i>DEPHYLS</i> SP. 22				
<i>FAMILY OPHELINAE</i> 23				
<i>KEMERTER</i> 24				
<i>LINEUS RUBER</i> 25				
<i>MICRURA</i> SP. 26				
<i>PARANEURTES</i> 27				
<i>PEREGRINA CALIFORNICENSIS</i> 28	6 2 1			
<i>CRUSTACEA</i> 29				
<i>GOROPHIDAE</i> 30				
<i>GAMMARIDAE</i> 31				
<i>IPOTHELE</i> SP. 32				
<i>CRAIG</i> SP. 33				
<i>CHLIRHASSA</i> 34				



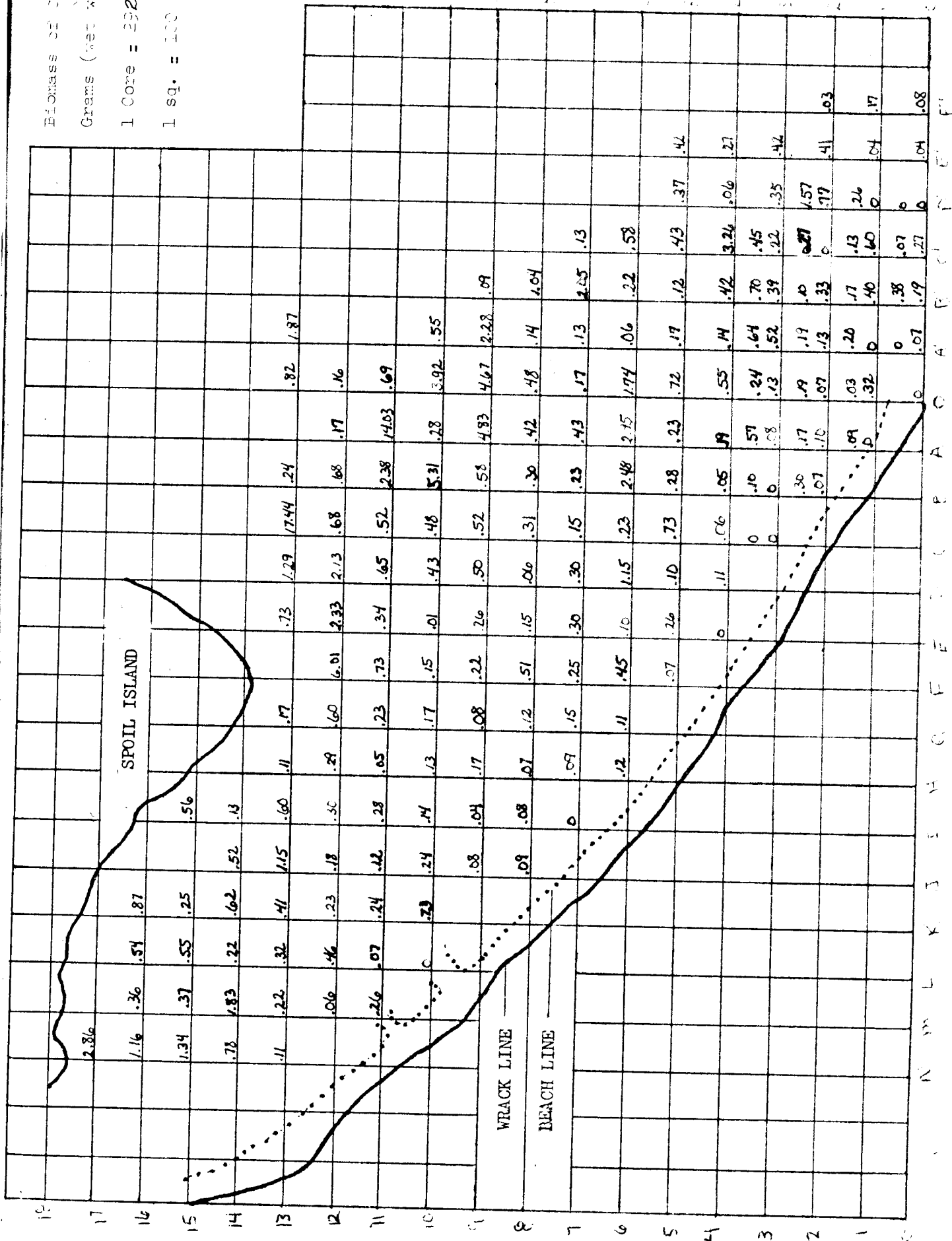
SPECIES	BIOMASS	AREA	
		1	2
WOOD CHIPS	2	0	0
3			
<i>MULLUSCA: 4</i>			
<i>MARELLA HASUDA</i>	5	1	2
<i>TELLINA SALMONEB</i>	2	1	2
<i>TELLINA BUTTONI</i>	7		
<i>CLINOCARDIUM KITZBALLI</i>	8		
<i>MYA ARENARIA</i>	9	1	
<i>CRYPTOMYA CALIFORNICA</i>	10	2	1
<i>PHILINE</i> SP.	11	2	
<i>MYTILUS EDULIS</i>	12		
<i>POLYCHAETA</i>	13		
<i>ETONE PACIFICI</i>	14		
<i>GLYCYDE ARMIGERA</i>	15	2	5
<i>NERINE CIRRIATULUS</i>	16	1	5
<i>CAPITELLA CAPITATA</i>	17	1	3
<i>ABARENICOLA PACIFICA</i>	18	1	2
<i>HESPERONCNE CAMPANATA</i>	19		
<i>EUNERESIS</i> SP.	20	1	
<i>NEREIS</i> SP.	21		
<i>DEPHYS</i> SP.	22		
<i>FAMILY OPHELIIDAE</i>	23		
<i>NEMERTEA</i>	24		
<i>LINEUS RUBER</i>	25		
<i>MICELURH</i> SP.	26		
<i>PARANEMERTES</i>	27		
<i>CEREBRATULUS CALIFORNICENSIS</i>	28	4	
<i>CRUSTACEA</i>	29		
<i>CLOROPHIDAE</i>	30		
<i>GAMMARIDAE</i>	31		
<i>IPOTHEA</i> SP.	32	2	
<i>CIRRI</i>	33		
<i>CALAPPANUS</i>	34		



Biomass of Core Samples  
 Grams (wet weight) core

1 Core = 2925 cc.

1 sq. = 100 sq. feet



DOCK

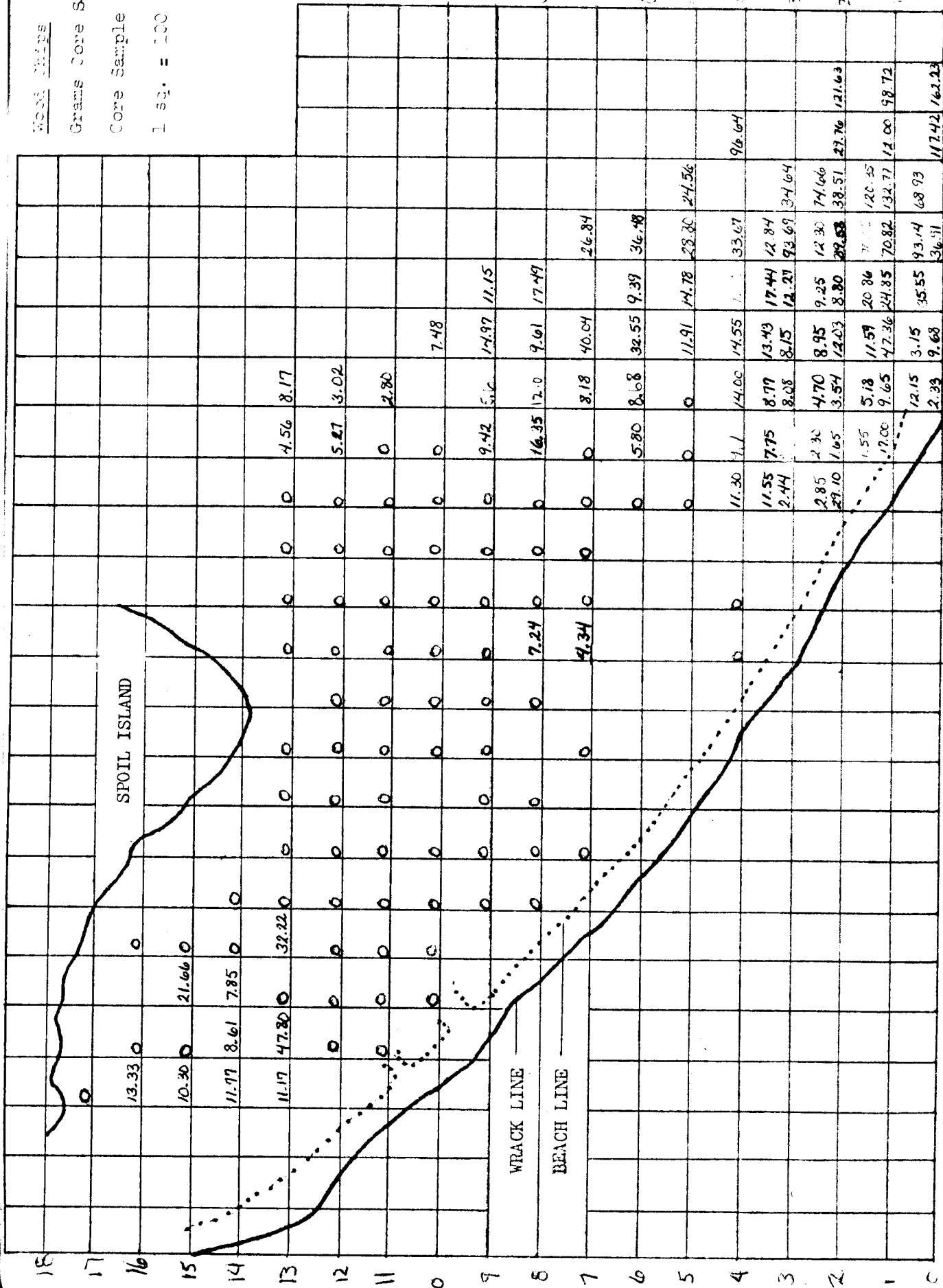
N W L K J I H G F E D C B A O

MOON DRAINS

Grams Core Sample

Core Sample - 2925 cc.

1 sq. = 100 sq. feet

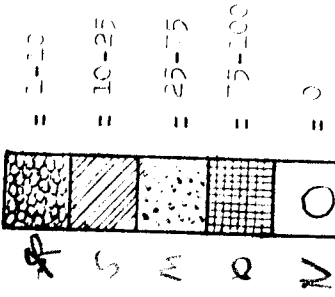


795 H  
 9 M  
 23 L

C N M L K J I H G F E D C B A O P Q R S T

DOCK

Legend



Seagrass Distribution

% cover/100' sq. area

SPOIL ISLAND

WRACK LINE

BEACH LINE

18

17

16

15

14

13

12

11

10

9

8

7

6

5

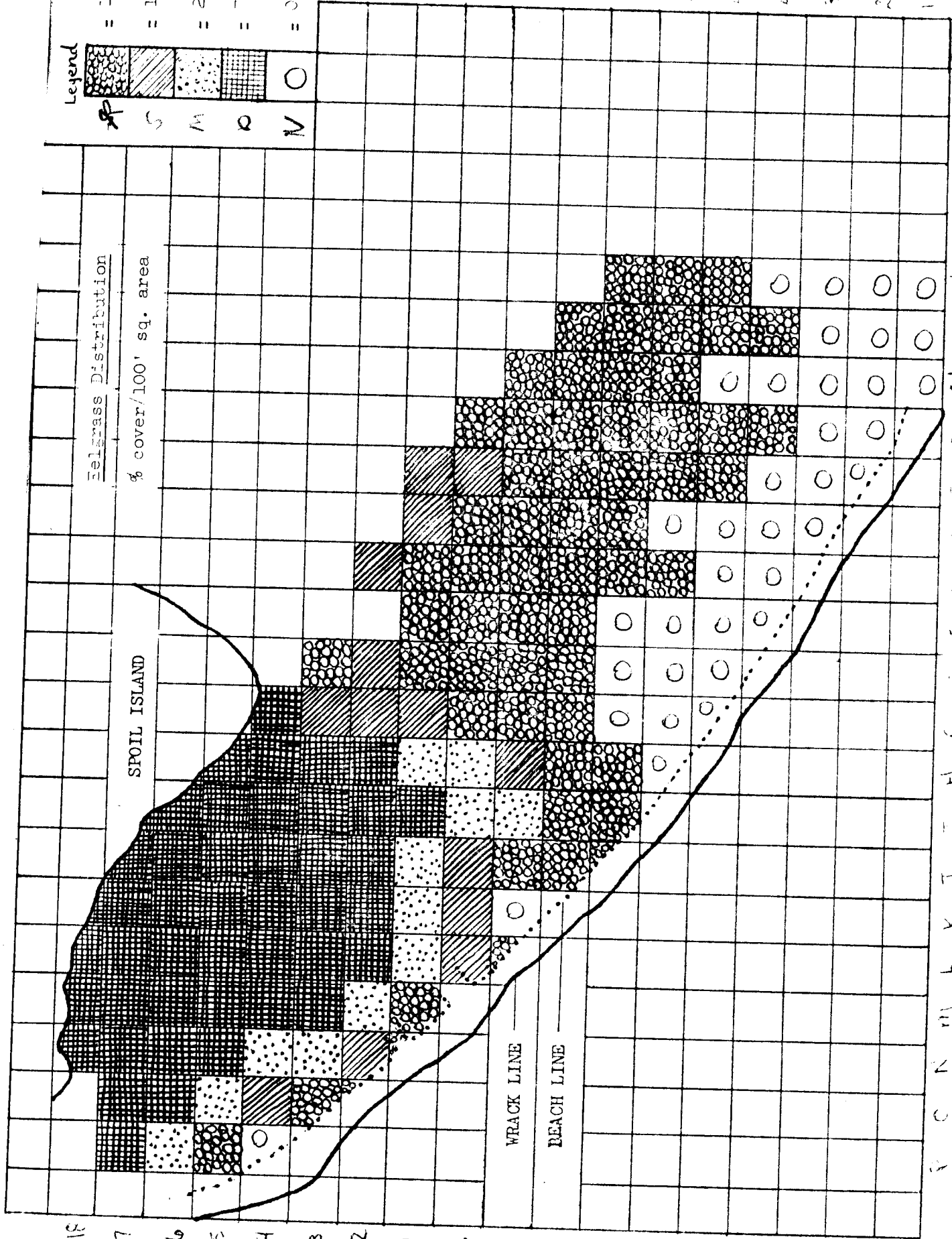
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3

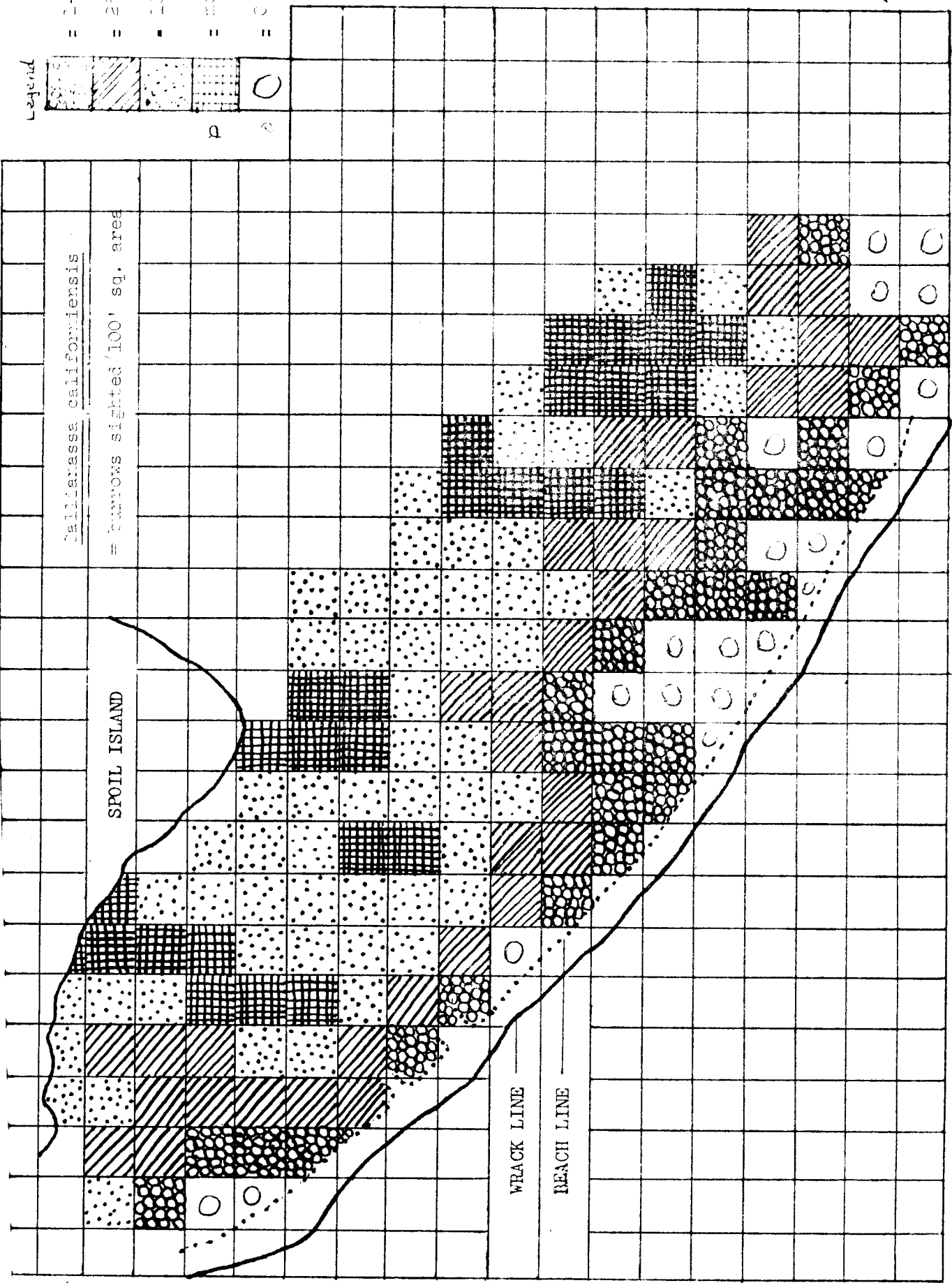
2

1

P O N M L K J I H G F E D C B A  
 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z  
 DOWN



Legend



*Callierassa californiensis*

= burrows sighted / 100' sq. area

SPOIL ISLAND

WRACK LINE

BEACH LINE

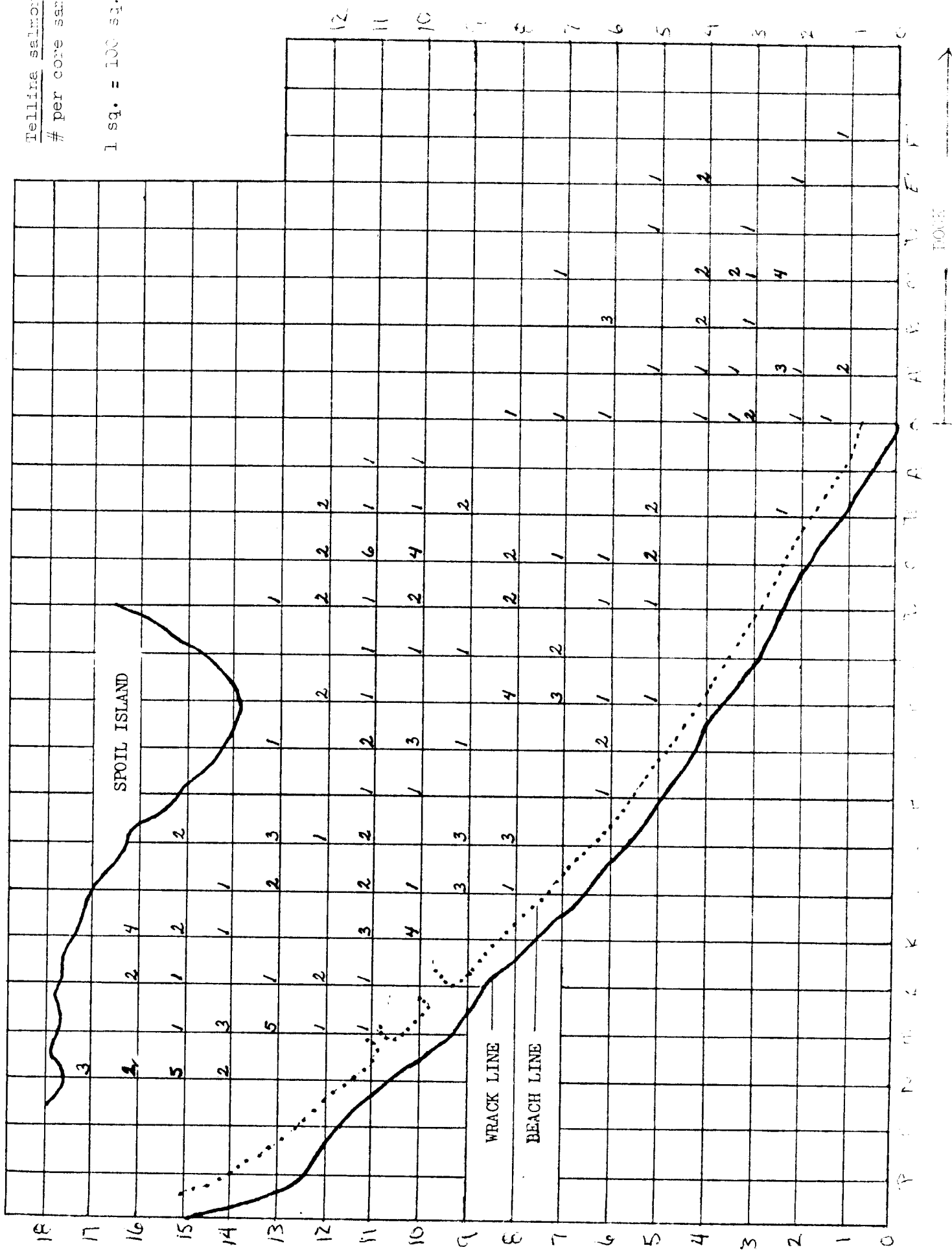
P Q R S T U V W X Y Z A B C D E F

DOCK

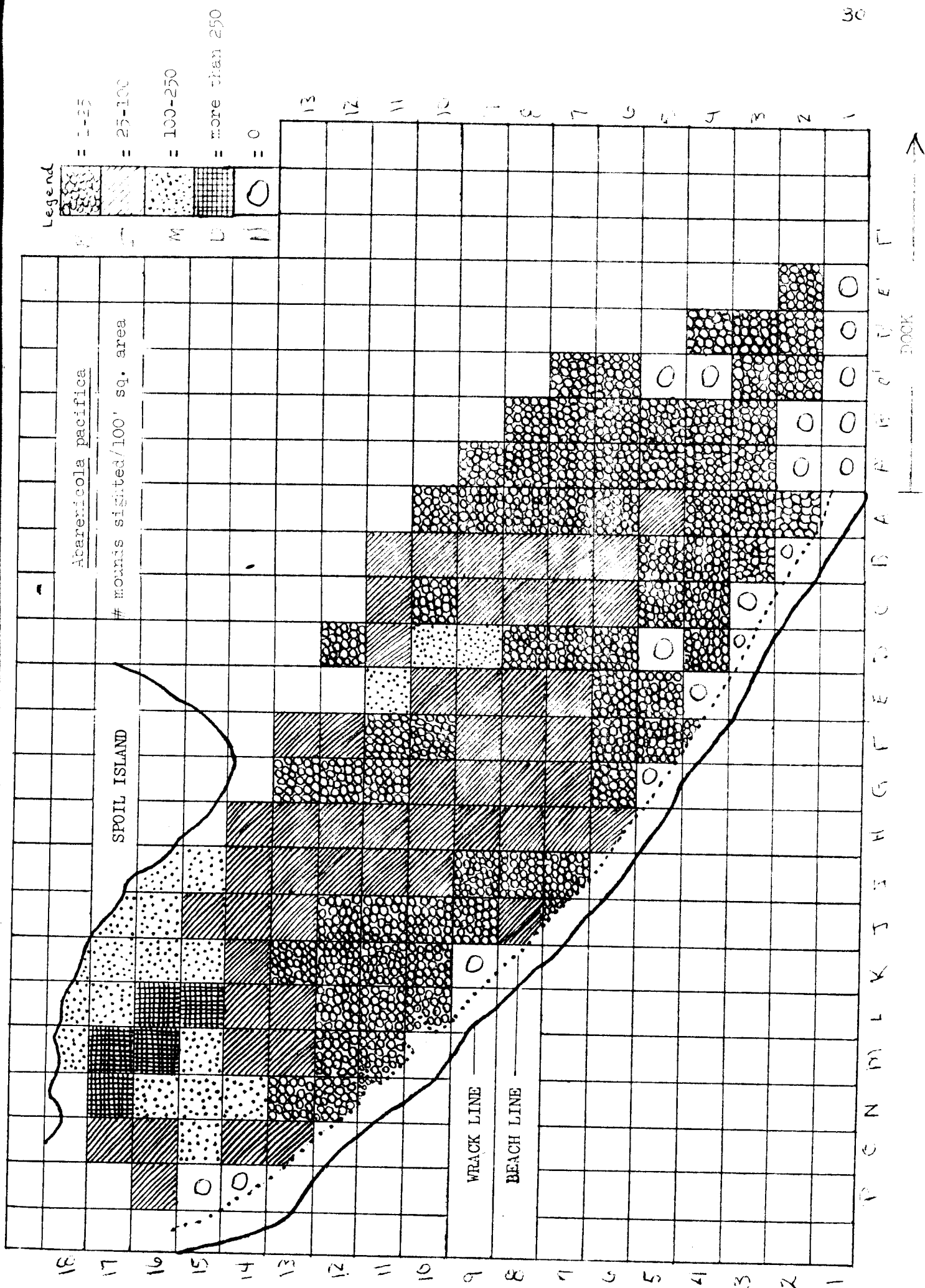


Telline salmonea  
# per core sample

1 sq. = 100 sq. ft.



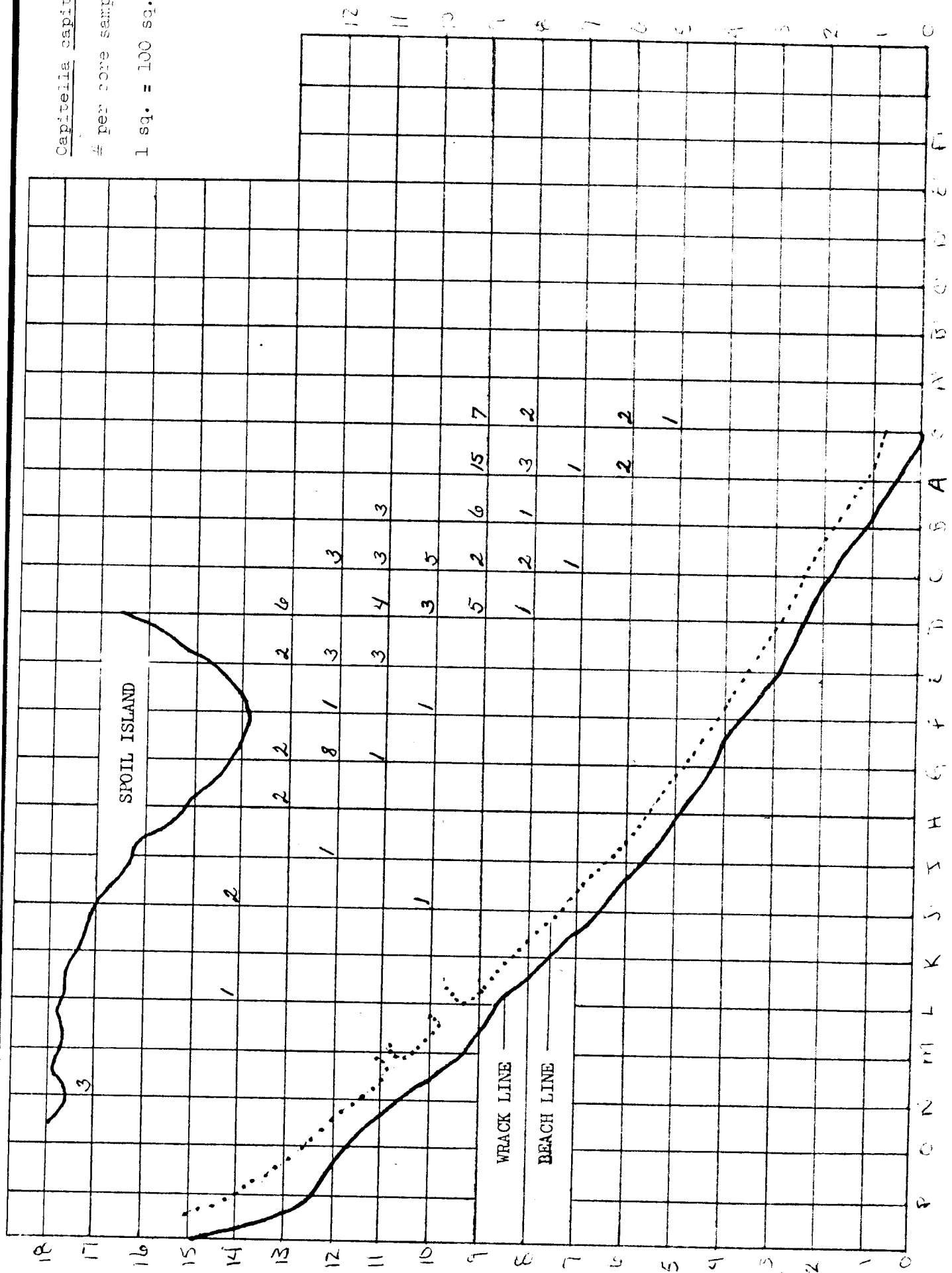




Capitella capitata

# per core sample

1 sq. = 100 sq. feet

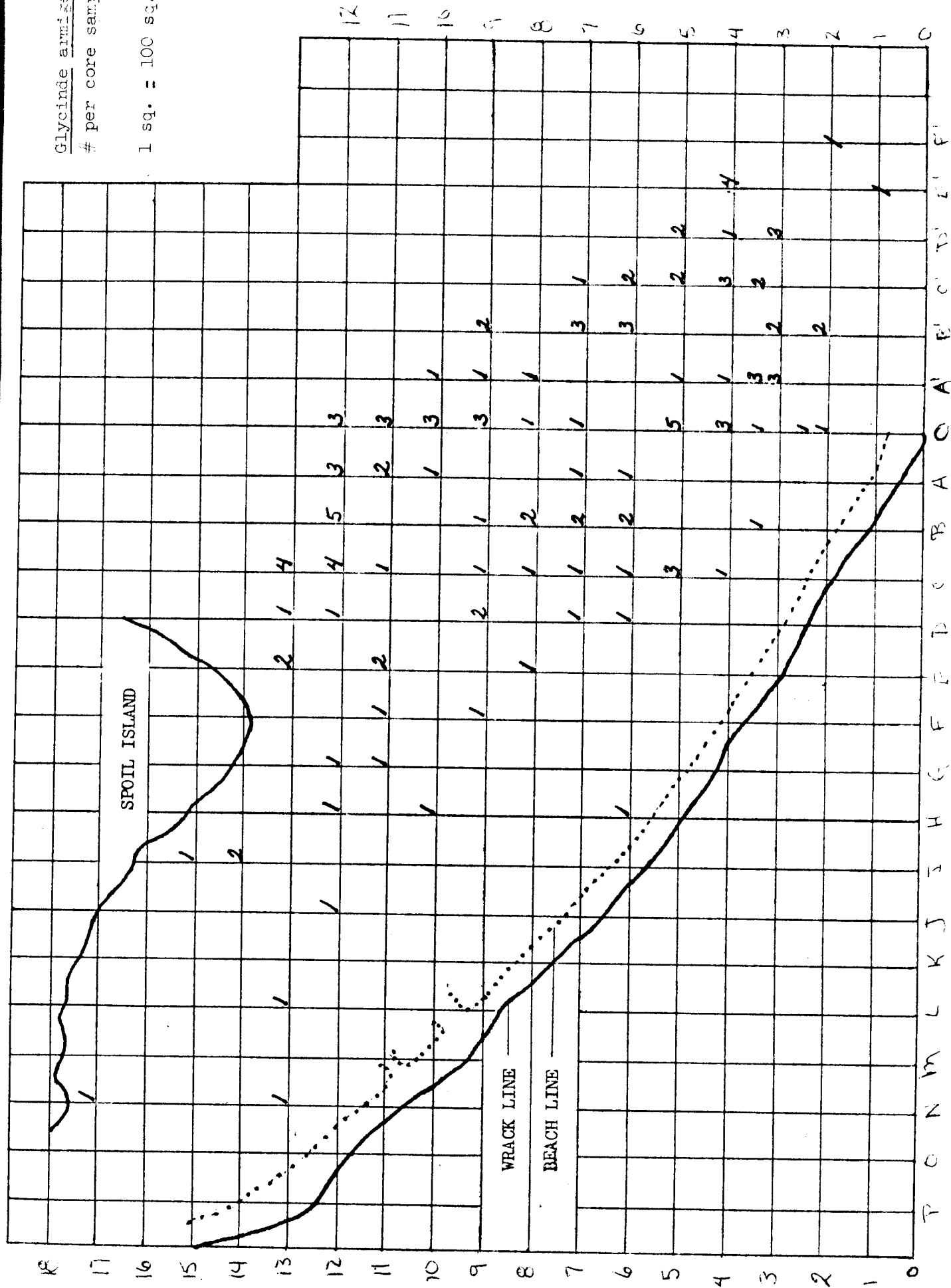


DOCK →



Glycinde armigera  
# per core sample

1 sq. = 100 sq. feet



DARK



Conclusions

In order to gain some understanding of the dynamics of the Coos Head Mill mud flat, information about the elevation, amount of wood chips, and amount of biomass was compiled. After careful scrutiny of the data, a few general correlations were observed. Feasible hypotheses were also proposed in order to explain and give more credance to the observed correlations.

Upon examination of the amount and distribution of wood chips it becomes apparent that wood chips were being carried out quite a distance from the outfall. The influence from the river and tide current appears to be washing the chips out. There are no obstructions in the way of the current in this particular area so the current may have its maximum effect. Except near the pier, when there are higher concentrations, the wood chips have been worked into the substrate. In the pier region there still remains a thin layer of the chips. The area between Spoil Island and the shore has an unusually high deposit of wood chips. It has been noted that in the past (McNab 1962) , the area out 100 feet near the outfall was covered by as much as two to three feet of wood chips. The deposit that is seen in the Spoil Island area is probably a remnant from the standing chips of the past. Also, the wood chips carried via the current would tend to be trapped and thus accumulate in the Spoil Island area due to the influence of the island. It was observed that current forces are retarded due to obstruction of Spoil Island. Thus the current cannot exert a strong force to move the chips out of this deposit. It

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is also believed that the high concentration of eel grass in that area (see map) may be of some influence in retaining the wood chips in that pocket. The slope in elevation is quite gradual in the Spoil Island area so the run off would not be very great and it wouldn't be expected to carry away many wood fibers.

When one examines the biomass maps, several general trends may be observed. First, the diversity and amount of organisms along the shore area is extremely low. Second, the organisms tend to increase in amount and diversity as one proceeds out from the shore to the center of the channel. Third, the amount and diversity of organisms appears to increase in the Spoil Island area. Finally, there appears to be an increase in the amount of organisms around the previously biologically destroyed outfall area.

As one examines the beach line (intersection of beach and mud flat), it is evident that the area is biologically negligible. Except for an occasional beach hopper (Orchestoidea spp.) life is minimal. Due to its high elevation this absence of life may be due, at least in part, to the absence of sea water during the majority of the time at intermediate tides. The current is known to travel down the shore (north to south) at high tide. This current may be carrying possible pollutants retarding the growth of organisms. (Quantitative supportive data unknown). Finally, the number of niches and habitats may just be small for a beach community. Additional research is recommended for this area.

The diversity and amount of organisms tends to increase as one proceeds out from the shore line towards the channel (excluding the pier and Spoil Island areas; discussion following). This increase in species may indicate a wider range of habitats are available out towards the channel. Judging from the biomass map, the toxic chemicals from the mill have dissipated, at least to some degree, allowing the area to be populated. Organisms out farther in the intertidal experience longer periods under water.

Relative to the mudflat as a whole, the area around the Spoil Island experiences an unusually high concentration of organisms. It became evident to the researchers that this area is under the influence of several factors. The current in this area is slowed down and curves in due to the influence of Spoil Island. The incoming water would thus tend to deposit suspended particulate matter in the area; thus possibly enriching the organic content of the area. Run off is rather minimal in this area due to the small degree of slope. There is a large number of tide pools in this area. Thus, organisms in the tide pool areas would not have the availability of water as a limiting factor in the development of the area. The eel grass may have a stabilizing effect to the ecology of the area. There is quite a variety of organisms in and near the eel grass. The amphipod populations tend to accumulate in the eel grass beds. One may even experience an occasional Pagurus spp. in the eel grass.

Possibly the most intriguing area in the whole Coos Head Mill mud flat is the area around the outfall in the pier region. This area has historically been observed as a biological disaster during the operation of the mill. It is now apparent that organisms are being established in



the area. It was established in the past (Oglesby - Summer 1969) that there were nearly no organisms near the outfall of Coos Head Mill (within 400 feet). It seems evident due to the size of the organisms studied that the organisms in this area are relatively new invaders. In the past the mill ejected large quantities of sulfite waste liquors into the bay via the pier outfall. Sulfite has a toxic effect, especially to the bivalve larva population. Until the sulfite could be incorporated into that area in a less toxic form the population of organisms would tend to decline. The sulfur fixing bacteria appear to be changing the sulfite into a less toxic volatile hydrogen sulfide and elemental sulfur. These sulfur fixing bacteria are known to exist in this region due to their characteristic odor and the observable dark band in the sand. The current may also carry away much of the sulfite waste liquors. The concentration of sulfite appears to be in low enough concentrations for organisms to move in, as compared to previous studies (see biomass map). Organisms now appear able to tap the rich amount of nutrients that have accumulated and laid idle for such a long period. The biomass is even higher as a whole in this pier area than in many other places in the Coos Head Mill mud flat except right near the outfall where organisms are just beginning to become reestablished. During the beginning stages of the study it was noted that discharge coming from the outfall was flowing down beneath the pier to the channel at low tide. The small biomass right at the outfall may be due to a small range of habitats and/or the concentration of sulfite and other pollutants that are still too high. (future research is recommended for this area).

It became apparent that the area did not support many of the commercial clams which appear so frequently in less toxic area of the estuary. Possibly because of the high sulfite concentrations or other factors prevents the common clams such as the gaper (Tresus spp.) from being established. A few Clinocardium spp. which are commercially valuable were found, but were extremely small (approximately 3 mm). Also absent in the area were examples of the little neck clam, Protothaca spp. or the Washington Clam, Saxidomus spp. A few promising examples of Mya clams were found but again these were extremely small.

In conclusion, the Coos Head Mill mud flat is an area that has been devastated in the past, but is returning to a "normal" condition. The organisms as a whole are relatively new invaders as compared to organisms down past the Charleston bridge. (Hartman, 1962) The pollution that had been deposited in this area is now being reduced to lower and less toxic concentrations. The future looks promising for the area if pollution is held at low levels. Given time, the area may provide great productivity.

## BIBLIOGRAPHY

1. Hartman, Olga, Donald J. Reish, The Marine Annelids of Oregon, Oregon State College Press, Corvallis, Oregon, 1950.
2. Light, S. F., Intertidal Invertebrates of the Central California Coast, University of California Press, Berkley and Los Angeles, 1970.
3. Macnab, J.A., A Preliminary Study of the Sources and Kinds of Pollution in Coos Bay, Oregon, Portland State College Public Health Laboratory, Portland, Oregon, 1964.
4. United States Dept. of the Interior, Natural Resources, Ecological Aspects, Uses and Guidelines for the Management of Coos Bay, Oregon, 1971.

## APPENDIX

May 9, 1972

Mr. Wiley Smith  
Coos Head Timber Company  
PO Box 750  
Coos Bay, Oregon 97420

Dear Sir:

This past season, through the University of Oregon Marine Biology Department, five students have been studying the estuarine area south of the Coos Head Pulp Mill in Empire, Oregon. We are conducting a population study of the invertebrate organisms which are residents of this area. We are now near completion of the study, and would like to write a brief history of the area in our report.

To adequately complete the report we need historical information of the area, both prior to the establishment of the mill and during its operation. Our advisor, Dr. Paul Rudy, Director, Oregon Institute of Marine Biology, suggested that you might have access to information of this sort. Any information that you might have which is related to the following topics would be of great help to us.

- 1) When was the mill built?
- 2) How long did it operate?
- 3) What was the reason for its closure?
- 4) What was the exact date of its closure?
- 5) How many workers did it employ?
- 6) Was there any direct effect on the economy of the area?
- 7) How many acres are encompassed by the mill and the surrounding property?
- 8) Has ownership changed hands since the mill first opened?
- 9) If so, what are the names of the previous owners?
- 10) To your knowledge, have any other studies been conducted on this precise area? What organizations were involved?

Any information that you are able to send us will be a great help. Thank you very much.

Sincerely,

Melissa Williams  
Steve Johnson  
Sheryl Stribling  
Dick Zeider  
Chuck Wood



**COOS HEAD TIMBER COMPANY** *lumber / plywood*

P. O. BOX 780 • COOS BAY, OREGON 97420 • PHONE 503-267-2193

May 13, 1972

Miss Melissa Williams  
542 East 12th St., #3  
Eugene, Oregon 97401

Dear Miss Williams:

We have your letter of May 9, 1972 regarding the pulp mill operations at Empire, and while there is a long history of the operation we will hit a few of the more pertinent points.

The mill was built in 1928 and 1929 by the Sitka Spruce Pulp & Paper Company and after a brief period of operation was closed down due to market conditions during the depression of the early 1930's. The mill resumed operations in 1935 after having been purchased by Coos Bay Pulp Corporation and in 1940 was sold to Scott Paper Company, Philadelphia, Pennsylvania. Scott operated the mill from 1940 to 1962 when it was sold to Coos Head Timber Company. The mill operated on a steady basis from 1935 on with the exception of some curtailments and temporary shut downs due to market conditions.

The mill was permanently shut down on April 23, 1971, at which time there was a depressed market for pulp and large inventories had built up at the producing plants in Canada, as well as the Scandinavian countries and elsewhere in the world markets. The pulp market moves in cycles and with its improvement the mill could have resumed operations except for the requirements placed upon us by the State of Oregon Department of Environmental Quality which were not economically feasible to comply with. These requirements included connection with an ocean outfall line to be followed within a three year period with a complete chemical recovery, as well as secondary treatment of the mill effluent. The costs of making these changes at our sulphite mill are so great, and in the range of three million dollars or more, and could not be justified as a prudent expenditure for a small capacity pulp operation.

The direct employment at the Pulp Division and the adjoining sawmill, which had to operate as a unit, was approximately 206 men at time of shut down. The employment for loggers and truck drivers and others in related activities in supplying logs to the mill involved a minimum additional 100 men. I am sure that some of your economists in your School of Business at the U of O can tell you the effect on the economy of the area from the loss of this many jobs, and a number of these men are still unemployed and particularly the older age group.

Miss Melissa Williams

-2-

May 13, 1972

The upland area at the site is approximately 65 acres and the adjoining fee owned tidelands exceeds 150 acres.

Over the many years that the mill operated, numerous tests were run to determine the dissolved oxygen content of the water, temperatures, pH, dissolved solids and numerous other tests to determine if there was any harmful effect on the aquatic life in the immediate vicinity of the mill. As you no doubt know, the clam bed immediately adjoining the south side of the pulp mill is one of the finest clam digging areas and continued so during the many years that the pulp mill operated.

We would be interested to know if your studies show that there has been any improvement in clams, crabs, fish or any other aquatic life in the vicinity of the mill since operations were discontinued in April of 1971.

Sincerely,

COOS HEAD TIMBER COMPANY

A handwritten signature in dark ink, appearing to read 'C. Wylie Smith', written over the typed name below.

C. Wylie Smith, Vice President

CWS/em



# FISH COMMISSION

## RESEARCH LABORATORY

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June 1, 1972

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Ms. Sheryl Stribbling  
542 East 12th, Apt. 2  
Eugene, Oregon 97401

OREGON INSTITUTE OF  
MARINE BIOLOGY  
Charleston OR 97420

Dear Ms. Stribbling:

In reply to your letter of May 22, 1972, inquiring about the Coos Head pulp mill at Empire, Oregon, I have the following comments.

I am taking the liberty of forwarding your letter to our Water Resources section. They very possibly have the answers to some of your questions. I will confine my comments to questions three, six and seven.

My understanding of why this mill closed was its age and the cost of modernizing it to the point that it could meet waste disposal standards. It was felt that the high cost of modernizing this old structure was economically unfeasible. The only other studies in the Coos Head pulp mill area that I am aware of were conducted by Dr. James MacNab, D. Fender and D. Long, Portland State University, and were funded by a Public Health Service grant. I am sure Dr. Rudy must have a copy of this work. Fish Commission personnel have made observations at this site for many years; however, none of these could be considered as a study. It is my personal opinion that the mill had an adverse effect upon recreational clam digging. This statement is based on clam surveys conducted just below the pulp mill in 1955, 1961 and 1966. During the 1955 survey, we found .17 gaper clams per square foot in an 1800 square foot sample. It was noted that the clam population occurred in the first 1,000 yards south of the pulp mill and 30 clam diggers were digging in the area. By 1961, biologists were calling the area "stinkhole" flat instead of "pulp mill flat". The 1961 survey indicated a population of .01 gaper clams per square foot and no clam diggers were observed. By 1966, we no longer were surveying the first 500 yards south of the pulp mill because of clam scarcity. However,

(continued)



Ms. Sheryl Stribbling

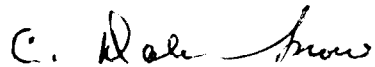
June 1, 1972

Page 2

walk through surveys were conducted but no clams were observed and evidence of digging was absent. It is my personal opinion that this decline in abundance of clams and subsequent use decline was directly related to the effluents and wood fibers settling out over this clam bed.

I hope that this has partially answered your questions; if you require additional information, please feel free to call upon me.

Sincerely,

A handwritten signature in cursive script that reads "C. Dale Snow".

C. Dale Snow, Program Leader  
Shellfish Investigations.

SNOW:ap

cc: Clackamas  
Angstrom



# FISH COMMISSION

## OFFICE OF THE DIRECTOR

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June 6, 1972

Ms. Sheryl Stribling  
542 East 12th, Apt. 2  
Eugene, Oregon 97401

Dear Ms. Stribling:

Mr. Dale Snow forwarded your May 22 letter regarding the Coos Head Timber Company Empire Mill to us for further answer. I will answer your questions as they were asked in your letter.

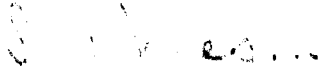
1. Coos Head Timber Company Empire Mill was operated by the company from 1946 to April 23, 1971.
2. It was operated by Coos Head management for 25 years.
3. The reasons for closure cited by F. Willis Smith were: "collapse of the pulp market, the cost-price squeeze and the many problems of waste disposal."
4. The mill employed about 70 people, and 30-35 were re-employed at the Bunker Hill Mill in the Coos Bay area. This resulted in a net employment loss of 35-40 jobs directly in the mill's employment. I think this could be reasonably called a direct effect on the economy of the area, although I think the question of "direct effect" should be answered by an economist.
5. About 47 acres of bay were affected by the Coos Head operation, those acres being essentially barren of clams. Pulp fiber was evident at low tide throughout the affected area.

Ms. Sheryl Stribling  
June 6, 1972  
Page 2

Mr. Snow answered points 5 and 6 on other studies and effect of the mill on clam digging.

I hope this information will help in your project.

Sincerely,



IRVING W. JONES  
AQUATIC BIOLOGIST



**EMPLOYMENT DIVISION**  
**COOS BAY LOCAL OFFICE**  
**DEPARTMENT OF HUMAN RESOURCES**

445 ELROD AVENUE • COOS BAY, OREGON • 97420 • Phone 269-9356

TOM McCALL  
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ROSS MORGAN  
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ELDON CONE  
Deputy Administrator

May 19, 1972

IN REPLY  
REFER TO

• • •  
**DEPARTMENT OF  
HUMAN RESOURCES**

JACOB TANZER  
Director

DIVISIONS  
Children's Services  
Corrections  
Employment  
Health  
Mental Health  
Special Programs  
Occupational Rehabilitation  
Welfare

Miss Melissa Williams  
542 E. 12th Street #3  
Eugene, Oregon 97401

Dear Miss Williams:

Of the topics you suggested, the only topic we are expert to comment about is the effect of Coos Head Pulp's closure on the economy.

In 1971 the average number of people working in Coos County was 21,070, so the loss of Coos Head Pulp mill's 100-person work force had little short-term direct effect on the economy. A number of the 100 people were put to work in expanded operations of Coos Head in Eastside. Some of the 100 employees had to start drawing unemployment insurance.

The long range effects of the closure may be greater. In Coos County over the past decade, the reduction in employment in certain basic industries such as lumber and wood products has been more than overcome by increases in employment in nonbasic industries such as retail trades and the service industries. However, if the basic industry jobs continue to decrease, the nonbasic industry jobs must decrease also. Manufacturing pulp is a basic industry job. Conservatively, in Coos County each basic job supports two nonbasic jobs. Thus, Coos Head Pulp's 100-person work force supported 200 nonbasic jobs for a total of 300 persons. If because of the closure of the mill, (a) the environment is cleaner so enough tourists are attracted to create 100 year around jobs, or (b) the closure of the mill causes 100 basic jobs to be created in other industries, or (c) for any other reason having nothing to do with the closure of the mill, 100 basic jobs are created, then the closure of the mill will not affect the economy. If 100 basic jobs are not created, there may be a net loss to the community, especially if the closure is added to the declining timber resources, and subsequent declining employment in timber companies in Coos County.

Most people are anxious to see the tourist industry grow as a creator of jobs to replace those lost in the wood products industry. However, too many tourists in any one area are in themselves a strong pollution to the environment.

Pulp and paper manufacturers are important users of wood waste, an item that can no longer be burned in wigwam burners. One may also ask the question, will the closure of a pulp mill cause some lumber or plywood mills to slowdown or shutdown because they have no place to utilize wood waste or chips in the face of the currently declining demand for chips by the Japanese?

In 1971, the number of jobs in Coos County only increased by 20! There are certainly far more than 20 students graduating from college each year and looking for work in the Coos County area! Competing for the net increase of 20 jobs are recent high school graduates, returning servicemen, and people from out of the area seeking a better environment in which to live.

For comments on other topics, we refer you, as did Mr. Day, to Mr. Willis Smith, President of Coos Head Timber, located in Eastside, P. O. Box 750, Coos Bay, Oregon 97420.

Very truly yours,



E. J. Konka, Manager  
Coos Bay Local Office

EJK  
RWM/ksj

cc: Coos Head Timber Company