ESTUARY RESOURCE SURVEY
SUBTITLE: CLAM INVENTORY TECHNIQUES STUDY

COMPLETION REPORT
July 1, 1971 to June 30, 1973

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Introduction

The objectives for this study were to develop techniques for determining distribution and abundance of intertidal and subtidal clam beds. Field techniques to determine the distribution of clam beds was emphasized. Information on clam distribution and abundance will eventually be used to assess the effect of sport and commercial fisheries on the resource and aid in management decisions.

During fiscal year 1973, intertidal clam sampling techniques were developed on Yaquina, Alsea, and Netarts bays. Subtidal clam sampling techniques were tested in Yaquina Bay.

Methods

Our sampling techniques were arrived at using a variety of methods, including literature search, talking to other investigators, and our own experience. Most benthic work by other investigators was done with tools such as Peterson grabs or modified oyster dredges. These methods were not chosen because they required special equipment and support vessels beyond our budget and because we felt they were not adequate for sampling deep-burrowing clams. Instead, a suction dredge was built, patterned after one used for subtidal clam work by the Washington Department of Fisheries. Methods were further modified after field testing.

Intertidal Sampling Techniques

Layout of Transects and Sampling Stations

Oregon's estuaries contain two basic types of tideflats: (1) broad expanses of intertidal area containing several hundred acres, and (2) narrow bordering strips sometimes several miles long. The type of tideflat governed the procedures used to lay out the transects. On large tideflats, we used permanent landmarks such as navigation markers or a compass course to orient the transect lines. Figure 1 is an example of transects set out spoke-wheel fashion, using a navigation marker as

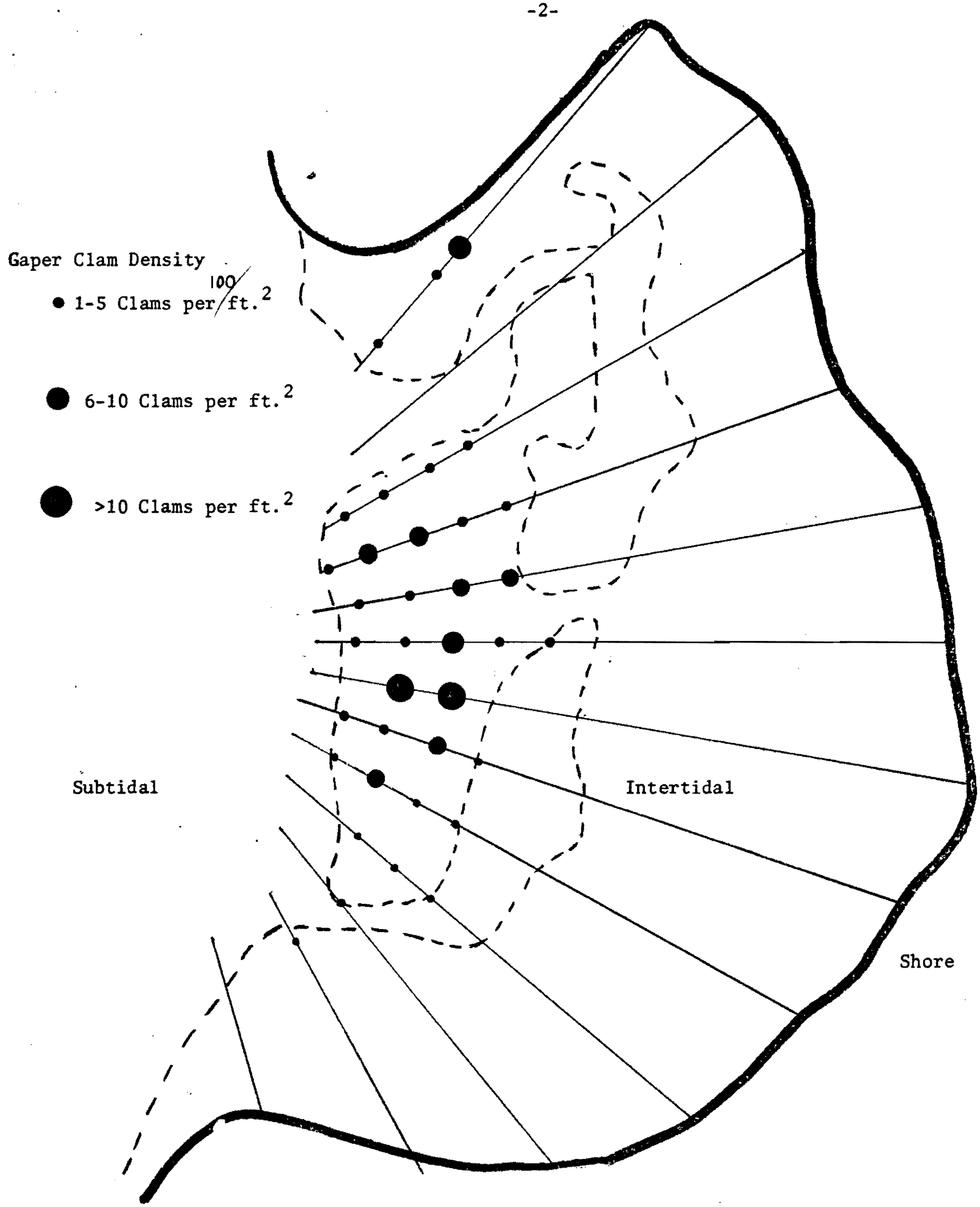

Figure 1. Yaquina Bay Intertidal Gaper Clam Distribution - Sally's Bend Area.

the focal point. The shoreward ends of the transect were 300 yards apart. Sampling stations were marked every 100 yards along the transect lines, using wood lath. An eight-wheel drive all-terrain vehicle (ATV) was used in laying out the transects and sampling stations. Distances were measured by using an odometer wheel.

Where no convenient land-marks were found, a base line was established along one shore of the estuary. From this base line, we laid out transects perpendicular to the shore, using a compass course. Transect lines and survey stations were set 100 yards apart, using the ATV and the odometer wheel.

Narrow tideflats were exemplified by the upbay softshell clam areas of Yaquina Bay. Most of the intertidal area was less than 100 yards wide with the clams confined to a narrow band, usually near the mid-tide level. A single transect line followed the shore line and samples were taken every 100 yards.

The main problem in laying out transects on any of the tideflats was soft mud. It was difficult to walk in and the ATV would get stuck by becoming high-centered. This problem may be overcome by using "tracks" over the wheels of the ATV.

Clam Sampling Techniques

At each sampling station, the presence and abundance of clams, substrate type, vegetation, and shrimp were noted. The following methods were used to document presence or absence of clams: (1) counting siphon holes; (2) raking the substrate; (3) dredging; and (4) digging a sample with a shovel. Each method worked best for a particular species or substrate condition. Figures 1 and 2 illustrate the kinds of information gathered by these sampling methods on one tideflat in Yaquina Bay. The gaper clam densities are in numbers of clams per 100 square feet of area. The eelgrass densities are a subjective judgement of sparse, moderate, or dense.

Counting Siphon Holes - Several species such as gaper, softshell, butter, cockle, and littleneck clams could be detected by the hole they leave in the substrate. The siphon tip of adult gaper clams could be seen or felt in the hole. If no tip was felt or if the walls of the hole had a slick lining, it was considered to be a shrimp

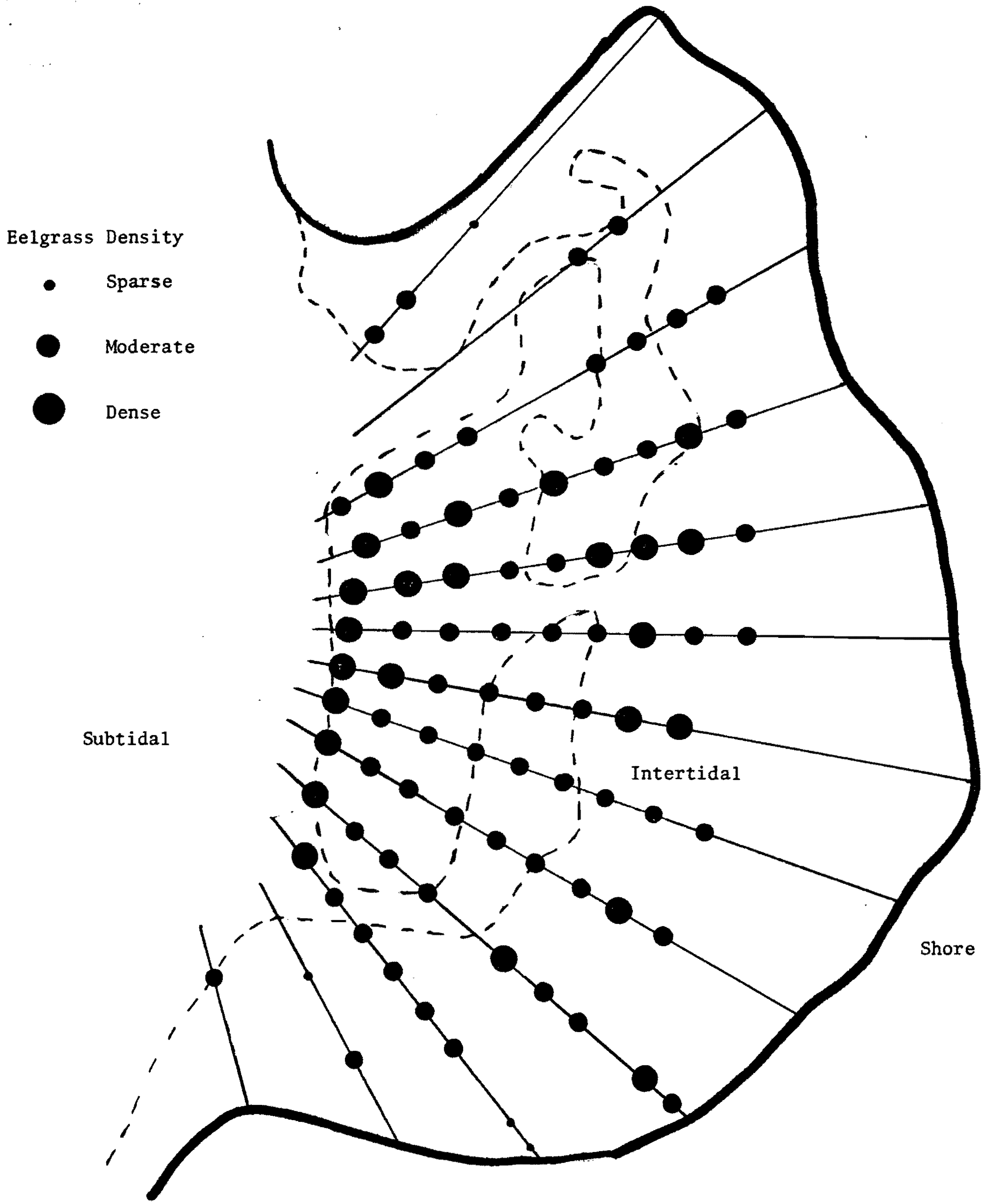

Figure 2. Yaquina Bay Intertidal Eelgrass Distribution - Sally's Bend Area.

hole. Holes left by other clam species were identified by their distinctive shape or by digging the clam.

The short-comings of this method were that only adult clams were detected and eelgrass obscured some siphon holes. In very dense butter clam or softshell clam beds, individual siphon holes were hard to count.

Raking the Substrate - Raking the sampling area with a clam rake exposed adult and some small cockle clams. In some areas, littleneck clams were located in this manner.

The disadvantages of this method were that it was selective for adult clams found close to the surface and dense eelgrass beds made raking difficult.

Dredging - The suction dredge is described in the FY 1972 annual report (Gaumer 1972). This dredge, under ideal conditions, removed a 6-inch diameter core of material down to two feet. The dredge collected all species and sizes of clams but certain substrates and dense eelgrass reduced its effectiveness (Gaumer 1972). The dredge could only be operated in one to four feet of water unless the intake end was controlled by a scuba diver.

Digging - Digging and screening a square-foot sample of substrate through a ½-inch mesh screen resulted in complete information as all sizes of clams were retained. Getting to water proved to be a problem with this method as a soft mud area often lay between the clam beds and the water. Except for random digging to verify clam identification, digging as a means of detecting clams was only used occasionally on narrow tideflats such as the softshell beds on upper Yaquina Bay. We established the landward and bayward boundaries of the clam beds, either by looking for sihpon holes or by digging. Next, the dug sample was taken within the established boundaries of the clam bed.

Subtidal Sampling Techniques

Layout of Transects and Sampling Stations

Surveying subtidal clam areas required new procedures. A boat and scuba were basic tools in our subtidal work. For sampling purposes, we divided the estuary into 2,000-foot sections that were identifiable on charts. Two ways to lay out transect lines were tried: (1) perpendicular to the shore, and (2) parallel to the shore.

With the line perpendicular to shore, we marked off the sampling intervals along the shore and ran the transect line straight out from shore. The position of the deep end of the transect was marked with an anchored surface buoy. The problem with laying out the transects perpendicular to shore was that the transect line drifted with the current and was difficult to control. Diving time was limited largely to slack tide when the current was negligible. Sampling parallel with the shore overcame both problems. The transect line could be placed even in a strong current and diving time was extended by allowing us to work 2 hours before and after slack tide.

Within each 2,000-foot survey section, we established transect locations perpendicular to the shore, starting 150-feet from the edge of the intertidal area and continuing at this interval across the subtidal area of the survey section (Figure 3). Prior to laying out the transect line, marker buoys were placed at the upstream and downstream ends of the transect location. Using the marker buoys as guides, the transect line with additional prominent surface buoys attached to each end was played out from a boat going with the current. The line was a 2,000-foot, polypropylene rope weighted at 10-foot intervals with 5 ounce gill-net leads and with sampling stations marked off every 100-feet. A Danforth anchor was snapped on one end of the line and placed into the current while a 25 pound concrete weight was snapped on the opposite end, downcurrent. This procedure ensured that the transect line was laid out taught and that divers would not dislodge the line when descending.

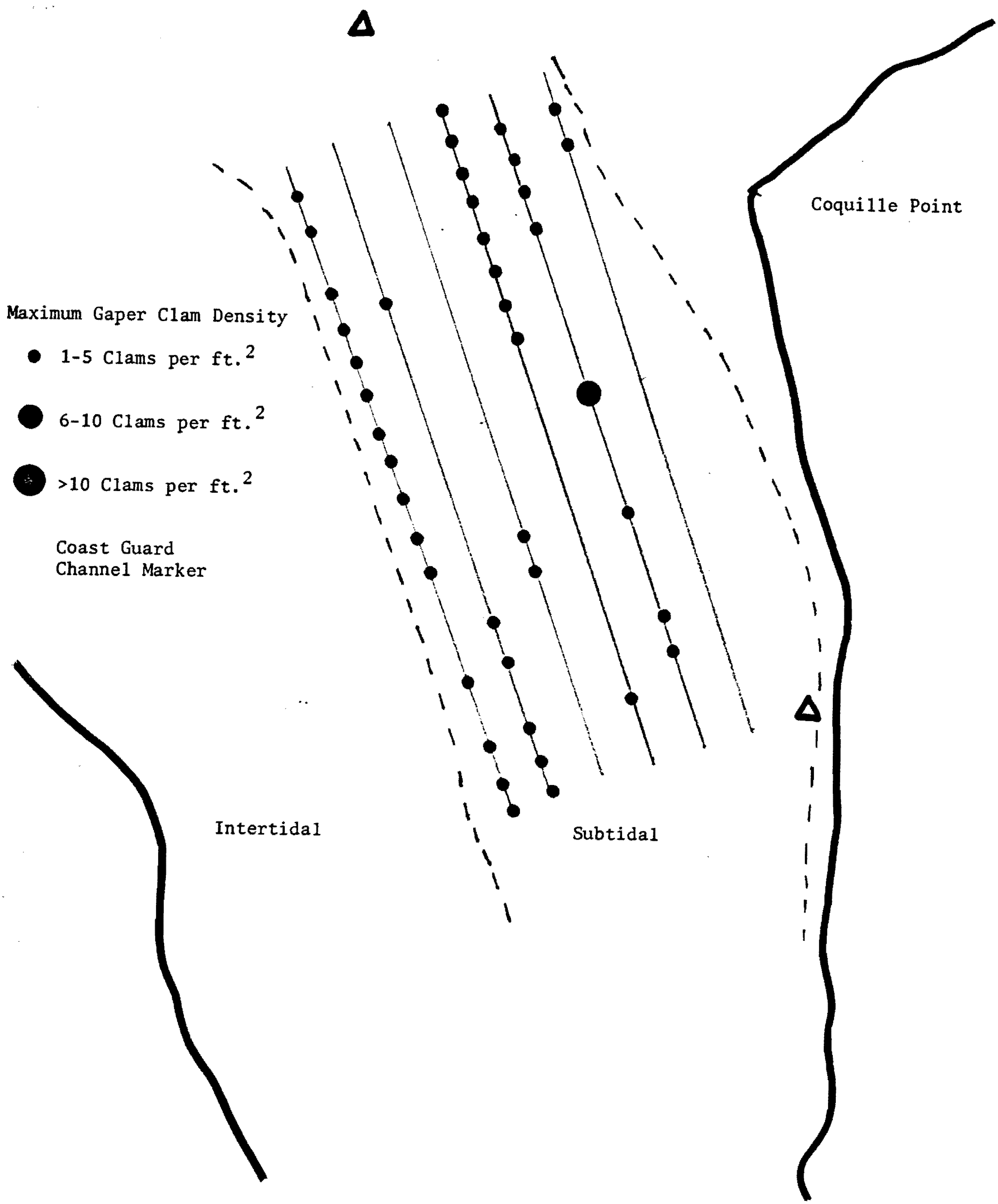

Figure 3. Yaquina Bay Subtidal Gaper Clam Distribution - Coquille Point Area.

Clam Sampling Techniques

Scuba divers were the vital link in sampling for clams subtidally. Two divers worked together and swam along the survey line with the current. At each sampling station, one diver made notes on (1) station number, (2) water depth, (3) maximum number of clams per square foot, (4) vegetation, and (5) substrate. A soft-leaded pencil and a sheet of acetate were used to record the data under water. While one diver recorded data, the other diver surveyed the general area for clams and relayed the information by hand signals.

Clams were located visually and by pounding and raking the substrate. The tips of gaper and piddock clam siphons were readily seen. Cockle and littleneck clams were sometimes found on top of the substrate. In areas that were covered with shells, it was difficult to see siphons. Pounding on the bottom made the clams withdraw their siphons, producing a noticeable "cloud" of sand or a depression in the substrate. This method worked best for adult gaper clams. Raking the sandy bottom with a hand rake located buried cockle and littleneck clams.

The main limitations of diving were excessive current and poor visibility. If the current were too strong, the divers could dislodge the Danforth anchor in descending and move the transect line out of position. Making notes was also difficult in excessive current. Poor visibility was caused either by suspended silt in the water or heavy plankton blooms and increased the chances of divers overlooking clams or losing sight of the transect line. Since visibility routinely was less than ten feet, the divers descended and ascended along the ropes to the surface buoys. This also gave some protection from boats since the conspicuous surface buoys kept boats away from the immedite vicinity of the ascending divers.

The main limitations on our subtidal clam sampling methods were (1) some species of clams could be overlooked, and (2) primarily adult clams were noted. Species with small siphons such as butter, littleneck, softshell, bentnose, and even cockle clams could be missed. Juvenile clams were probably overlooked.

Figures 3 and 4 illustrate the kinds of information gathered by these methods in one subtidal area of Yaquina Bay. The eelgrass densities were a subjective judgment of sparse, moderate, or dense.

Literature Cited

Gaumer, Thomas F. 1972. Estuary Resource Study. Comm. Fish. Res. and Devel. Act. Ann. Rept., July 1, 1971 to June 30, 1972. Fish Comm. of Ore. Proc. Rept. 6p.

PART 2: SUMMARY OF ACCOMPLISHMENTS JULY 1, 1971 TO JUNE 30, 1973

We developed or tested several techniques for locating clams intertidally and subtidally. A suction clam dredge was built and field tested. The dredge removed all species and sizes of clams but certain substrates and dense eelgrass beds reduced its effectiveness. The scattered distribution of some clam species would have forced us to take a large number of samples to locate clams. Therefore, for information on clam distribution we chose to make clam siphon counts and rake the substrate in addition to taking limited dredge samples. Our sampling tended to overlook juvenile clams. Once the clam beds have been delineated, the dredge will probably be used extensively for information on abundance and size of clams present.

An 8-wheel drive all-terrain vehicle (ATV) was an essential part of our sampling equipment since some sampling transects were 1,300 yards long. Work accomplished per tide-series would be greatly reduced without an ATV. In soft mud, the vehicle tended to dig down and get high centered. Tracks on the wheels reportedly would overcome this problem but we have not tested them.

Procedures for locating clam beds subtidally were developed, using scuba equipment. The main limiting factors for diving were excessive currents and turbidity. Our sampling methods favored finding adult gaper and cockle clam beds and tended to overlook other species and juvenile clams. Our justification for these methods were

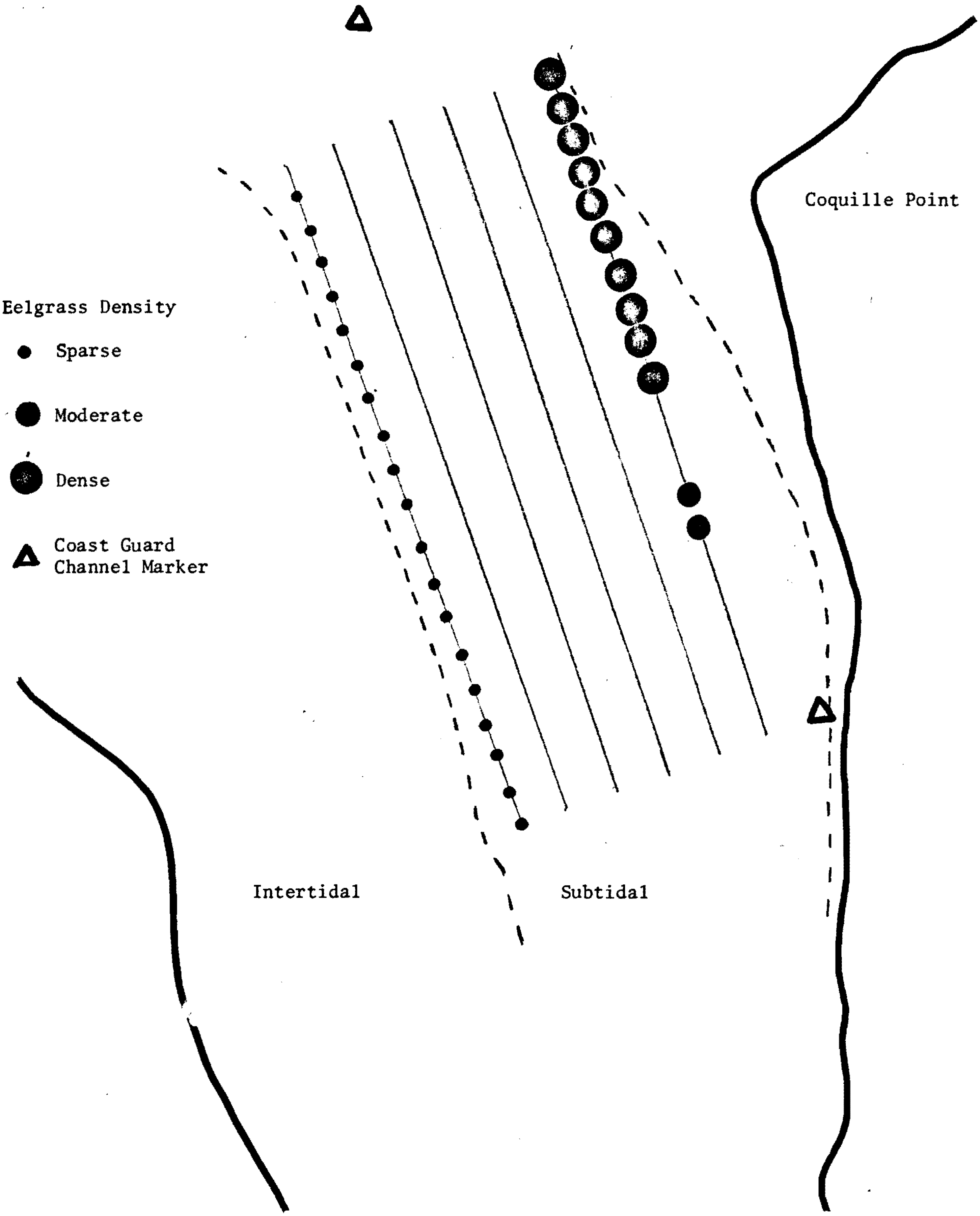

Figure 4. Yaquina Bay Subtidal Eelgrass Distribution - Coquille Point Area.

that cockle and gaper clams were numerous and easy to locate subtidally and could be used as indicators of clam beds in general. Subtidal dredging with the suction dredge substantiated this, as butter clams were found within a gaper clam bed in Yaquina Bay. These butter clams had not been noted by our divers in the initial survey. The suction dredge will play an important role when we seek information on age classes and species diversity within the established clam beds. Additional dredge work will also be necessary where gaper and cockle clams have not been found to conclusively find out if these areas are devoid of clams.