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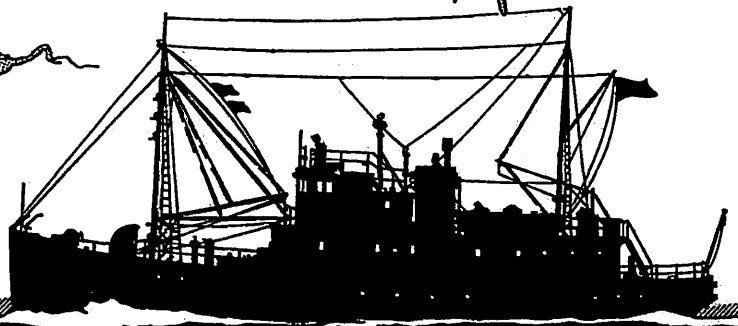
Technical Report No. 33

SUBMARINE PHOTOGRAPHY IN PUGET SOUND

Office of Naval Research
Contract N8onr-520/III
Project NR 083 012

Reference 54-19
May 1954



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UNIVERSITY OF WASHINGTON DEPARTMENT OF OCEANOGRAPHY
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SUBMARINE PHOTOGRAPHY IN PUGET SOUND

by

James A. Gast and Wayne V. Burt

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Richard H. Fleming
Executive Officer

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ABSTRACT

Conventional underwater photographic techniques were adapted for use in Puget Sound and neighboring waters. Photographs were obtained to depths of 850 feet at a number of locations in the Sound. Over half of the exposures resulted in intelligible photographs. Some of the clearer and more detailed bottom photographs are presented in this report.

Due to the turbidity of the water, the region is marginal from the standpoint of underwater photography. Although the camera was usually set at only five and one-half feet above bottom, most of the pictures show some haze and only a few were extremely sharp.

INTRODUCTION

There is no published information available on the operation of submarine bottom cameras from shipboard in the Puget Sound region. The present study was undertaken to determine the feasibility of obtaining bottom photographs and to ascertain the most successful techniques to use. Subsequently, it is planned to utilize bottom photography as an aid in examining the bottom during biological and geological studies.

Immediate use of the photographs obtained for this report is being made in the engineering study for the projected 230 KV cross-sound power cable which is being contemplated by the Bonneville Power Administration. A second use has been found in correlating the results of various bottom sampling techniques employed near Anacortes, Washington. This is part of a study to determine biological conditions prior to the establishment of industries which may contribute pollution to the water.

INSTRUMENT AND PROCEDURE

Camera

An early Ewing type (1) shallow water suspended assembly was available for use (See Figure 1). It contained a Robot rapid sequence camera housed in a tin-plated brass case. The camera is equipped with a Schneider Xenar f2.8 lens and produces 24 mm square negatives. The camera produced the most consistent results when focused for a through water slant distance of 7 feet and set at an angle of 35 degrees from the vertical.

Lighting

The original flash reflector, which was mounted near the base of the vertical staff holding the assembly, was an automobile headlight reflector which had been adapted for this use. It produced a concentrated beam which tended to make the center of the photograph much lighter than the edges. A glass reflector from an overhead indirect lighting fixture (2) was substituted for the original reflector. It has a diameter of 12", has a pebbled surface and is backed by an aluminum mirror surface. The glass was enclosed in a brass housing which in turn was bolted to an extension to the vertical staff. This system of lighting, which gives an even field of illumination, proved satisfactory. The results of trial and error showed that the best lighting was obtained with the reflector set at 70 degrees from the vertical at 3 feet from the bottom. G. E. #5 photo flash bulbs were used.

Photographic Materials

Kodak Plus-X film was used. It was developed in Microdal, according to the manufacturer's instructions. Some trials were run with Kodak D-76 which showed no improvement over Microdal. Prints were made on No. 4 Kodabromide enlarging paper after trying out several other types of papers and paper contrast numbers. Prints were developed in Dektol according to the manufacturer's instructions. Numerous trials indicated that the most consistently good negatives were obtained at an aperture of f8.0 with an exposure time of 1/100 of a second when the camera and light were in the positions mentioned above.

One roll of Kodachrome was exposed. The results indicated that color photographs could be obtained with the camera, provided that sufficient illumination were provided to allow for the above aperture and exposure time.

Water Transparency

Secchi disc readings of the surface waters ranged from 4 to 10 meters with an average of 4.5 meters during the trials. These readings appeared to be roughly indicative of the transparency near the bottom in depths of less than three hundred feet. For average conditions, photographs resulting from camera to bottom distances of much over five and one-half feet (seven feet thru water slant distance), showed evidences of backscattering somewhat like the results of shining a spotlight through a haze or fog. In clearer waters, some relatively good photographs were obtained with camera to bottom

distances of eight feet.

Frame Identification

Experience has shown that it is desirable to have some positive means of identifying frames, such as placing an identifying number on a bracket which would protrude into the field of the camera close to the bottom. A second possibility is to photograph a marked slate on deck after every three or four underwater exposures.

RESULTS

Figure 2 shows the general location of photographs included in this report. The subsequent figures are reproductions of these selected bottom photographs. The captions offer an interpretation of what may be seen in each of the various photographs.

REFERENCES

(1) Ewing, M., A. Vine, and J. L. Worzel
1946. Photography of the Ocean Bottom
Jour. Opt. Soc. Amer., Vol. 36, No. 6, pp 307-320

(2) Pittsburgh Reflector Co., Pittsburgh, Pa.
Trade Name: PERMAFLECTOR

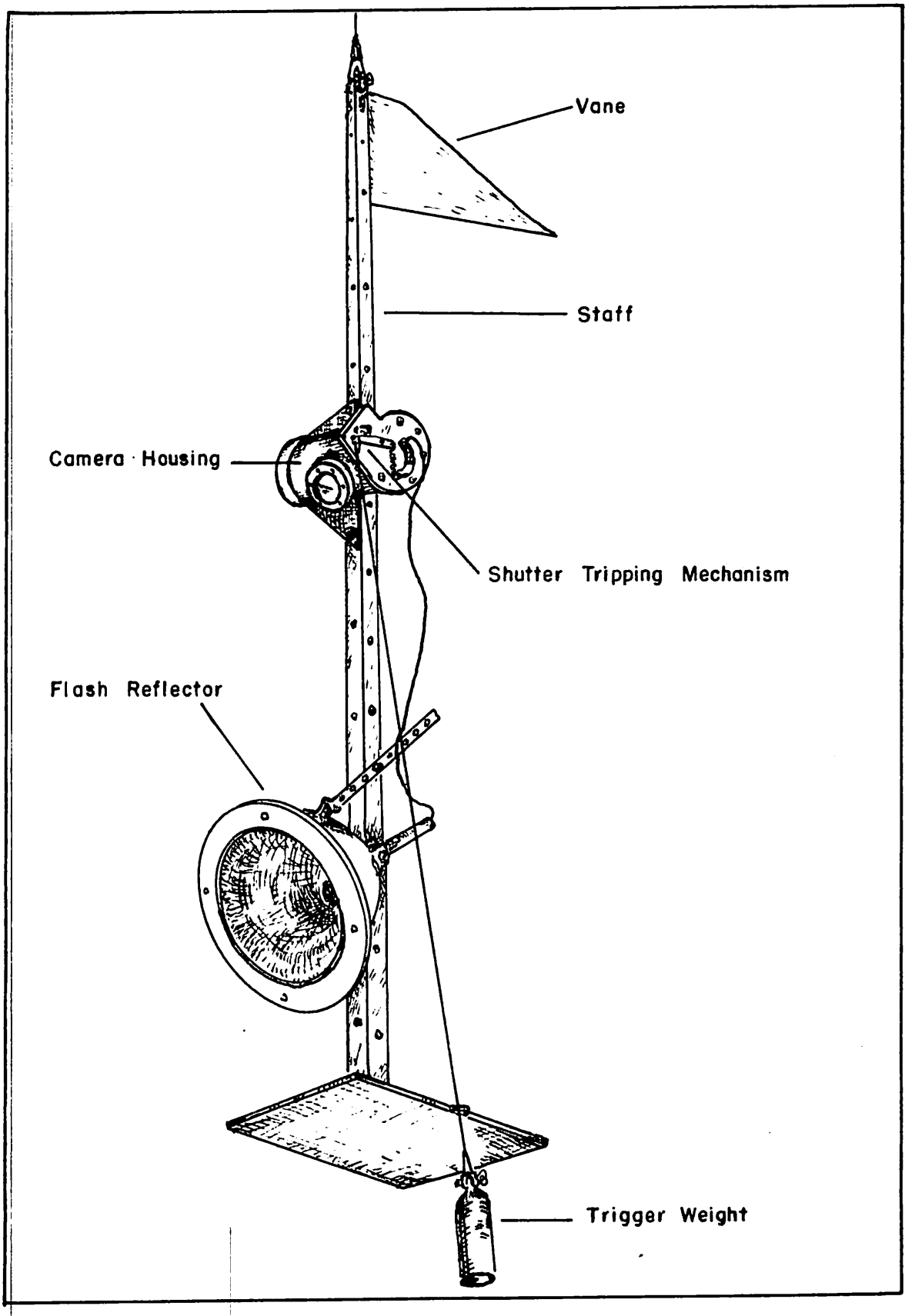

FIGURE 1. Schematic drawing of the camera.

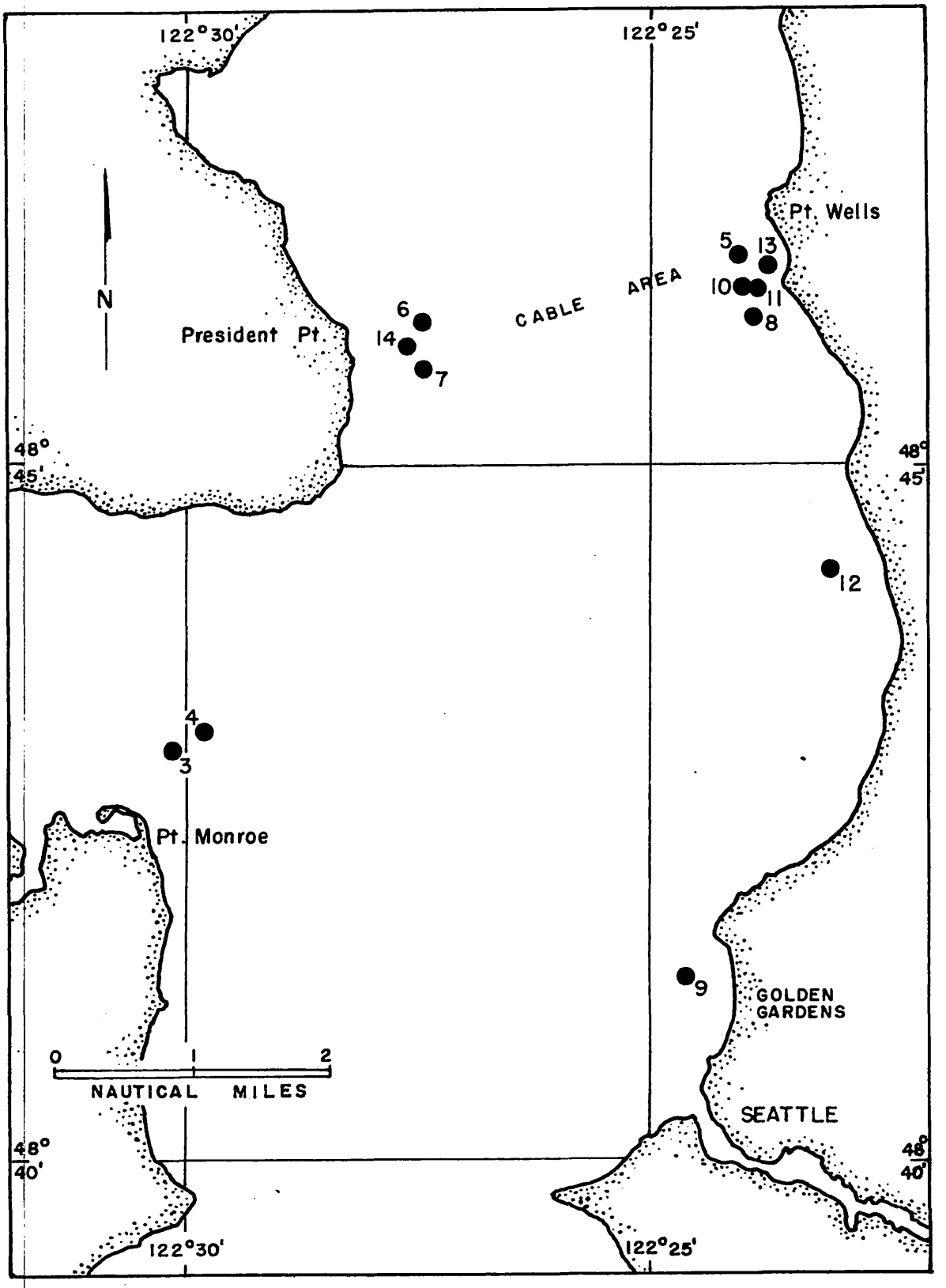

FIGURE 2. Location chart of the photographs. Numbers indicate location of Figures 3 through 14.

Figure 3. Point Monroe. Depth: 89 meters.
Irregular mud bottom with numerous small burrows.

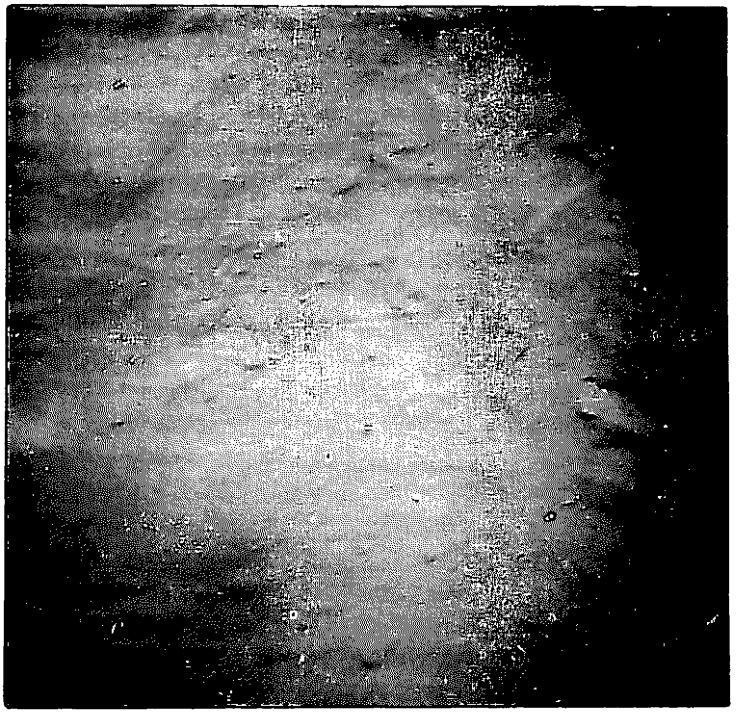

Figure 4. Point Monroe. Depth: 98 meters.
Irregular mud bottom with numerous small burrows.

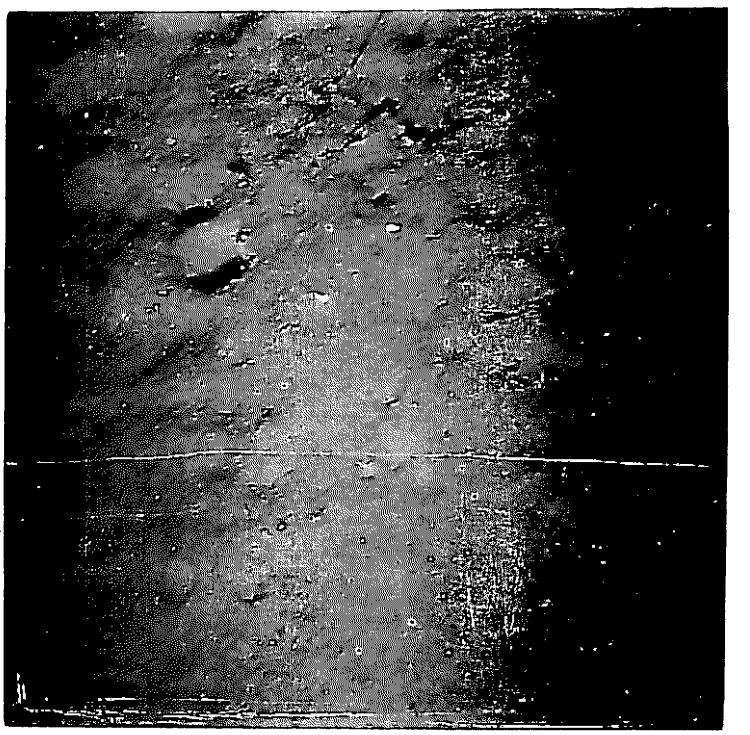

Figure 5. Point Wells. Depth: 75 meters.
Sandy mud bottom with faint ripple marks, some small shell fragments and a few burrows.

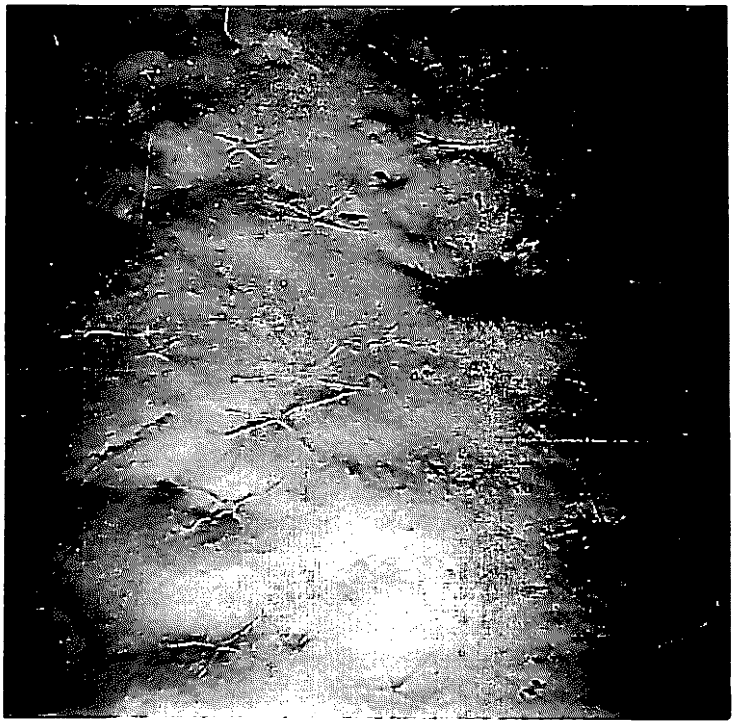

Figure 6. President Point. Depth: 110 meters.
Irregular sandy mud bottom, numerous brittle stars and a few burrows. The small mounds may possibly be covered gravel, shells or similar objects.

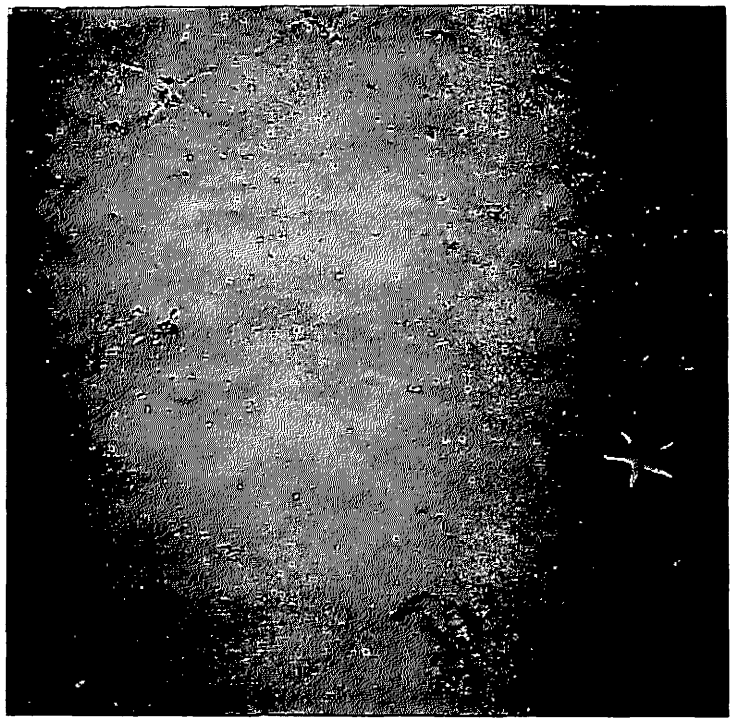

Figure 7. President Point. Depth: 56 meters.
Rippled sandy bottom with some brittle stars and one other starfish.

Figure 8. Point Wells. Depth: 56 meters.
Flat sandy gravel with some organic debris and shell fragments. Bottom growth is possibly hydroids. The two fish are thought to be Hydrolagus colliei.

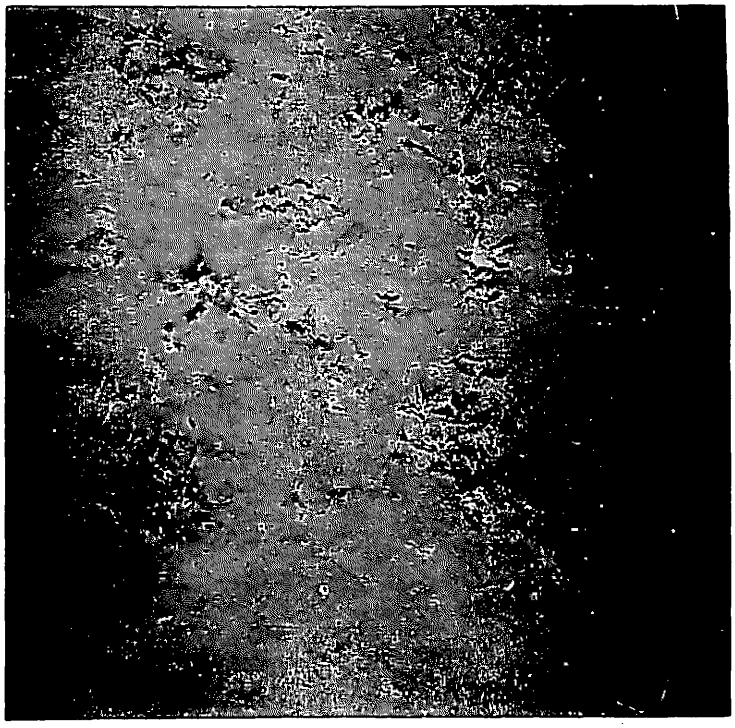

Figure 9. Golden Gardens Park, Seattle. Depth: 48 meters. Nearly smooth mud mixed with sand and gravel. Two starfish and numerous hydroids.

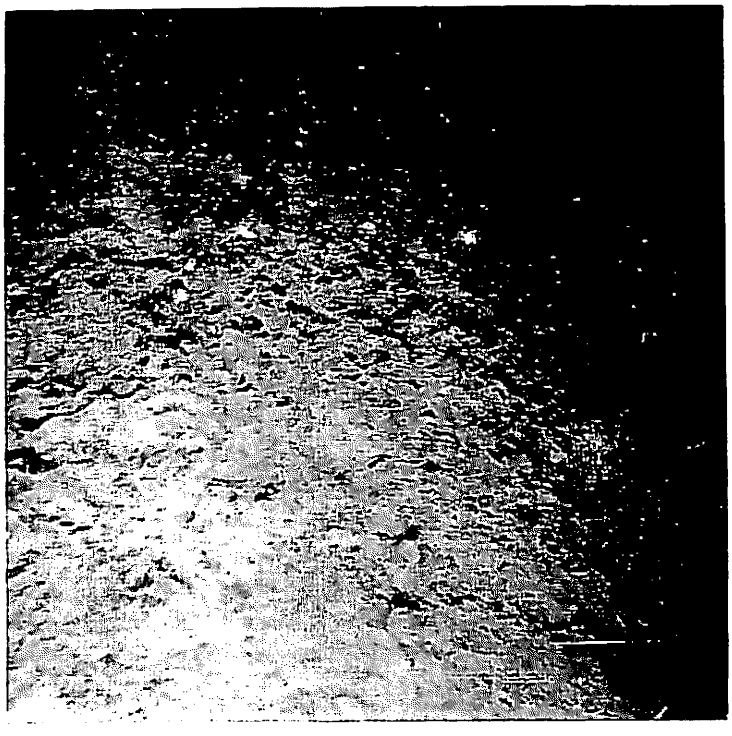

Figure 10. Point Wells. Depth: 64 meters. Gravel bottom covered with organic debris and numerous shell fragments.

Figure 11. Point Wells. Depth: 64 meters.
Sandy gravel bottom with some shell fragments and organic debris.

Figure 12. Boeing Creek. Depth: 76 meters.
Sloping firm mud bottom, probably underlain with sand and gravel, with a growth of sea anenomes and hydroids.

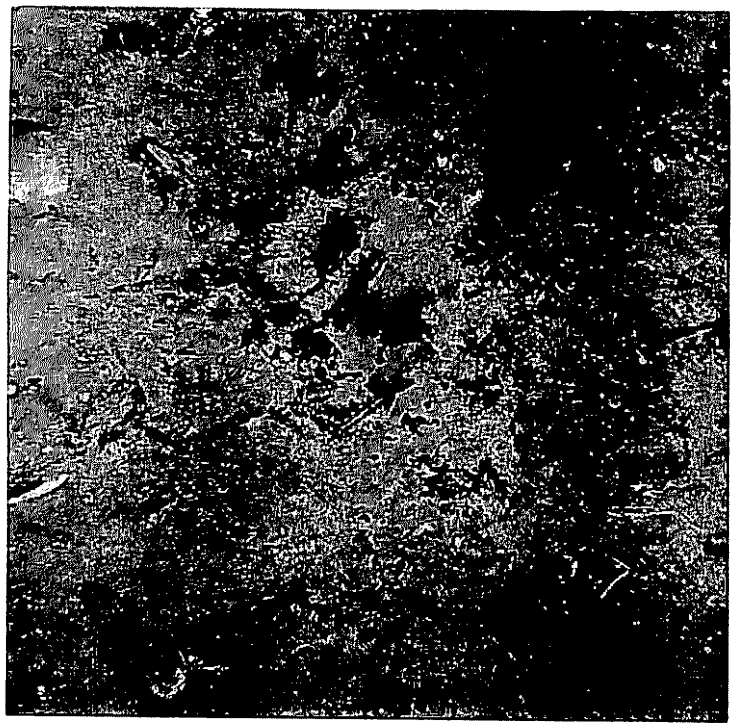

Figure 13. Point Wells. Depth: 19 meters.
Undulating coarse sand containing shell fragments, whole shells, and organic debris. Note the maple leaf in the center.

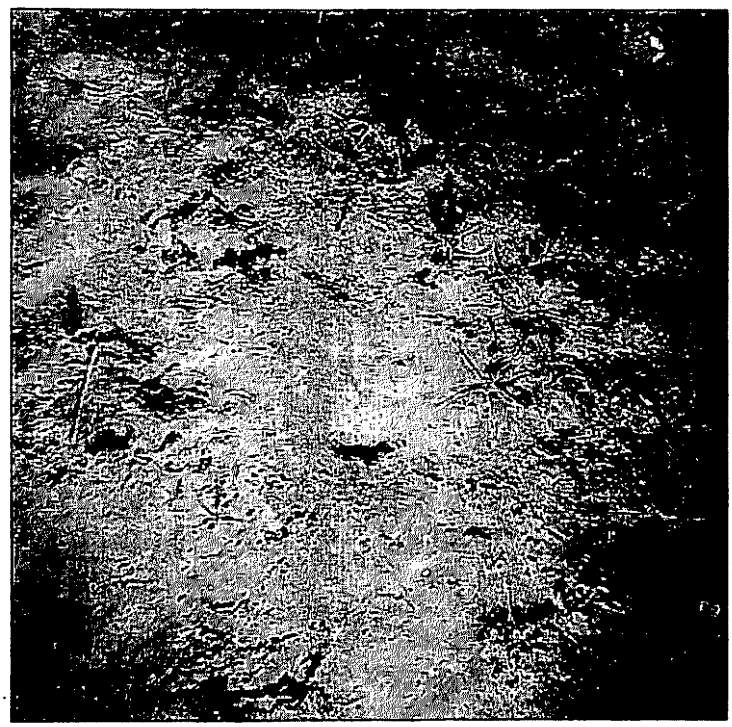

Figure 14. President Point. Depth: 41 meters.
Irregular sandy mud bottom with hydroids, brittle stars, and shell fragments.

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