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A SURVEY OF BIOLOGICAL UNDERWATER NOISES OFF THE COAST OF CALIFORNIA AND IN UPPER PUGET SOUND

by

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September 10, 1943

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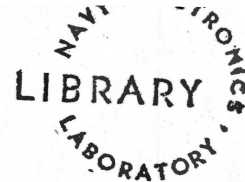
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References: (a) BUSHIPS ltr Serial No. C-0352(940Dd) of 23 May 1946 to UCDWR and other addressees.
(b) BUSHIPS ltr Section 940, Security--4 Serial No. C-5619(940Dd) to CNO dated 11 March 1946.
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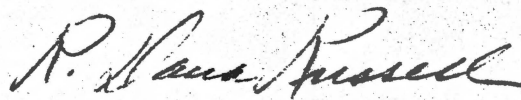
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Abstract

This investigation was undertaken to obtain information on the northward extension of crackling underwater noises characteristic of the coastal waters of Southern California and for the purpose of observing if there were any seasonal changes in background noises in the Puget Sound area which had been visited previously in November 1942. The regions visited include Santa Barbara, San Luis Obispo, Monterey and Eureka to Crescent City in California, and Admiralty Inlet and the San Juan Archipelago in Puget Sound.

The characteristic crackling noises produced by snapping shrimps were found only at Santa Barbara, San Luis Obispo, and Monterey. In the northern California and Puget Sound areas where these animals have not been reported the waters were relatively free from biological noises, only very weak crackling and piping sounds were detected. There was no noticeable seasonal change in noise conditions in the Puget Sound area.

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A SURVEY OF BIOLOGICAL UNDERWATER NOISES OFF THE COAST OF
CALIFORNIA AND IN UPPER PUGET SOUND

INTRODUCTION

In order to obtain additional information on the northward extension of serious crackling underwater noises on the Pacific Coast of North America, a rapid survey was made by the writer between July 30 and August 21, 1943 in the areas indicated below.

A further objective was to learn if any notable seasonal fluctuation in ambient noise could be detected in that part of Puget Sound surveyed for biological noises in November 1942.

The same portable listening equipment was used as in the East Coast survey (Ref. 1). This consists of a Brush C23 hydrophone with a 25-foot cable and an amplifier equipped with a meter for indicating relative intensities of sound. Use was also made of directional listening equipment aboard Naval vessels at San Luis Obispo Bay, Monterey Bay, and in the Eureka-Crescent City region. In Figs. 1 to 6 are indicated the approximate positions of stations where the portable listening equipment was used. The ships' gear was usually used between stations while under way at slow speed.

The UCDWR wishes to acknowledge the courtesies extended by Naval and Coast Guard personnel at the various locations visited, who provided ship facilities and cooperated otherwise in a most generous manner. Preliminary arrangements for facilities were made by the U. S. Navy Radio and Sound Laboratory, San Diego, California.

RESULTS

Santa Barbara, California

In this area a small Coast Guard patrol boat was made available. The area covered (Fig. 1) all lies in water depths favorable for snapping shrimps. The bottom habitat is also favorable in and near the areas of kelp. Some crackling was heard in the harbor, consisting of frequent but not abundant intense cracks, suggesting a rather sparse but nearby population of shrimps, perhaps living among fouling organisms or debris on or near the harbor installations. Outside the harbor, crackling was most intense at the stations located in the immediate vicinity of kelp beds, apparently arising from the activity of larger shrimp populations living among the branches of kelp holdfasts ("roots"). At increasing distances from the kelp beds, the crackling became progressively less intense and at the whistling buoy, 3/4 to 1 mile seaward off the kelp beds and over soft muddy

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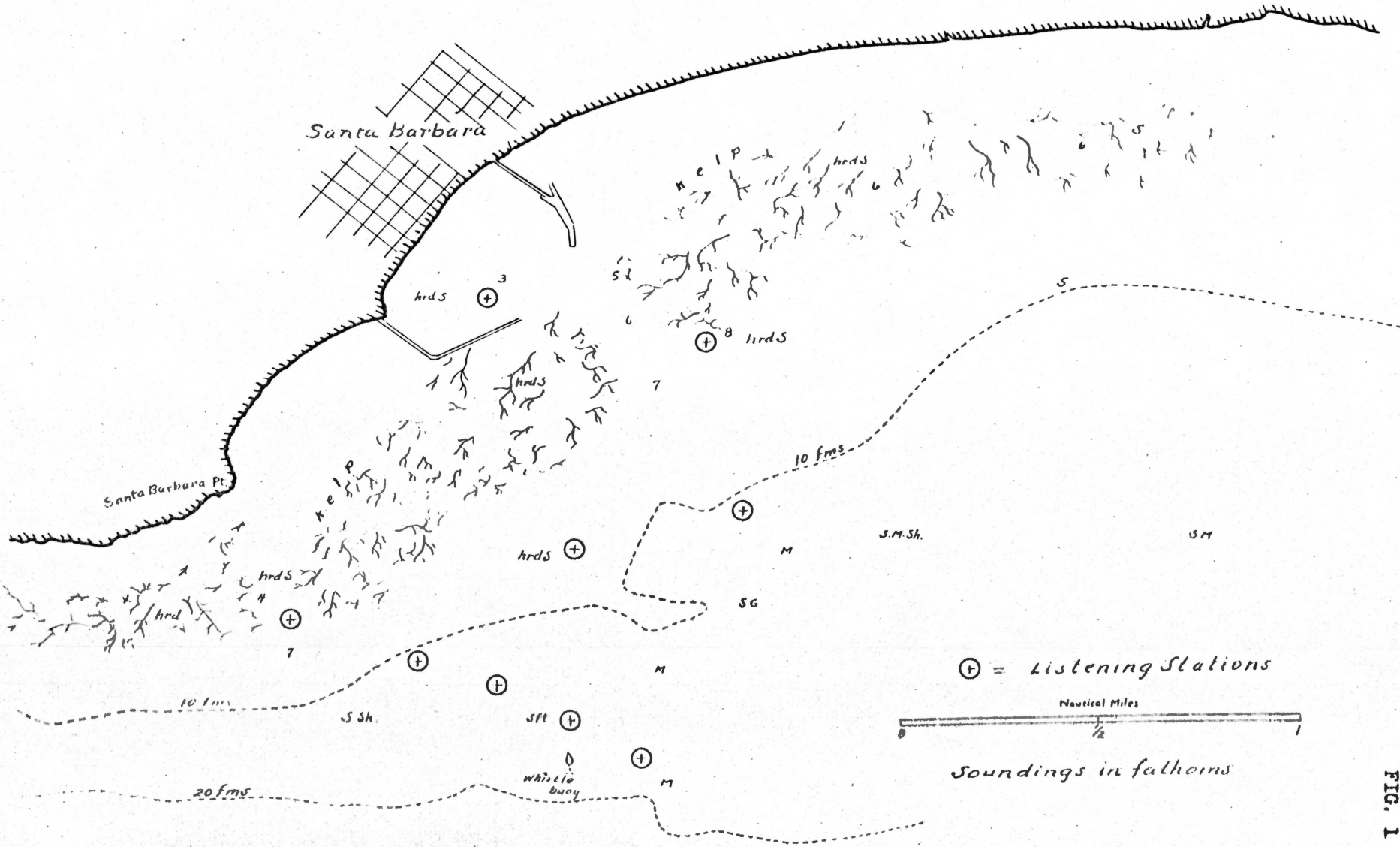


FIG. 1

bottom, only a sizzling sound (about 15 to 20 db below the sound level prevailing at the kelp bed stations) could be heard. This sizzle appears to be the residue from the distant crackling.

San Luis Obispo Bay, Avila, California

Here the work was carried out aboard a patrol vessel stationed at the Avila Section Base. All of the area surveyed (Fig. 2) is within the depth range of snapping shrimps. The bottom character is varied though largely rocky, and this is reflected in the variability of background noise encountered. Crackling noise was found at all stations but with greatest intensity at Station 3 off Westdahl Rock in water of 15-17 fathoms. Here the sound level was about the same as at Scripps Institution Pier (La Jolla) and about 20 db higher than at stations 1 and 6. Of all the areas covered by the present survey, this one was characterized by the highest noise level though background noise was also high near Santa Barbara kelp beds. At all stations occupied it was possible to "pick up" the nearer noisy spots by training the ship's directional listening equipment.

In this area it was reported that sometimes there is much more trouble from background noises than at other times. This is of interest because repeated observations elsewhere have indicated only relatively small fluctuations in crackling noise (due to shrimps) in any affected area. The observed fluctuations in San Luis Obispo Bay may perhaps be explained by failure of the observer to note the geographic patchiness of the noise. This might easily lead to the interpretation that there is a great fluctuation in intensity associated with time. Listening in different localities only a small fraction of a mile apart may disclose quite different sound intensities, or listening while at anchor in a spotting area will appear to give fluctuating levels unless sharp watch is kept of the bearings on which the directional listening equipment is trained. It should be noted, however, that the above area is still within the distributional range of certain soniferous fishes (croakers) some of which are known to be periodic in their noise production.

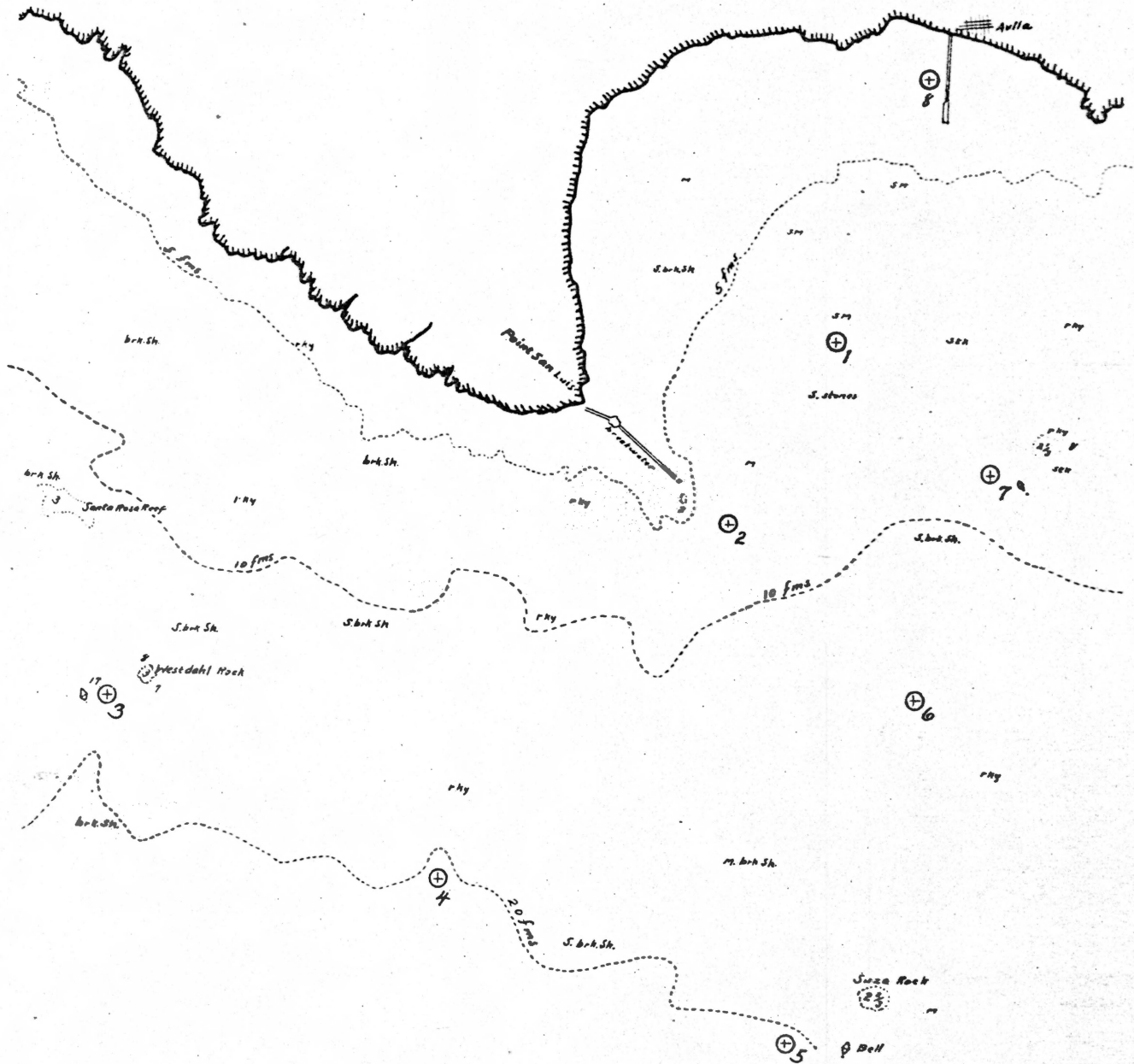
Monterey Bay, California

Listening observations made in this area (Fig. 3) were carried out aboard a large patrol vessel from the Monterey Section Base. Crackling noise was found at all but the deeper (over 30 fathoms) stations but was most pronounced in Monterey Harbor where it was, however, only moderately loud. Some interference was experienced here from ship traffic in the harbor.

Eureka to Crescent City, California

Facilities for working this coastal region (Fig. 4) were provided by the U.S.S. SHAWNEE, a Coast Guard vessel from the Eureka Section Base. No loud crackling background noise, such as is characteristic of the more southern areas, was encountered at any of the

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San Luis Obispo Bay

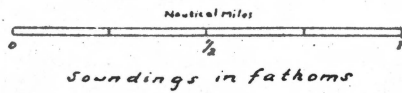
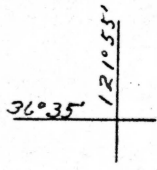
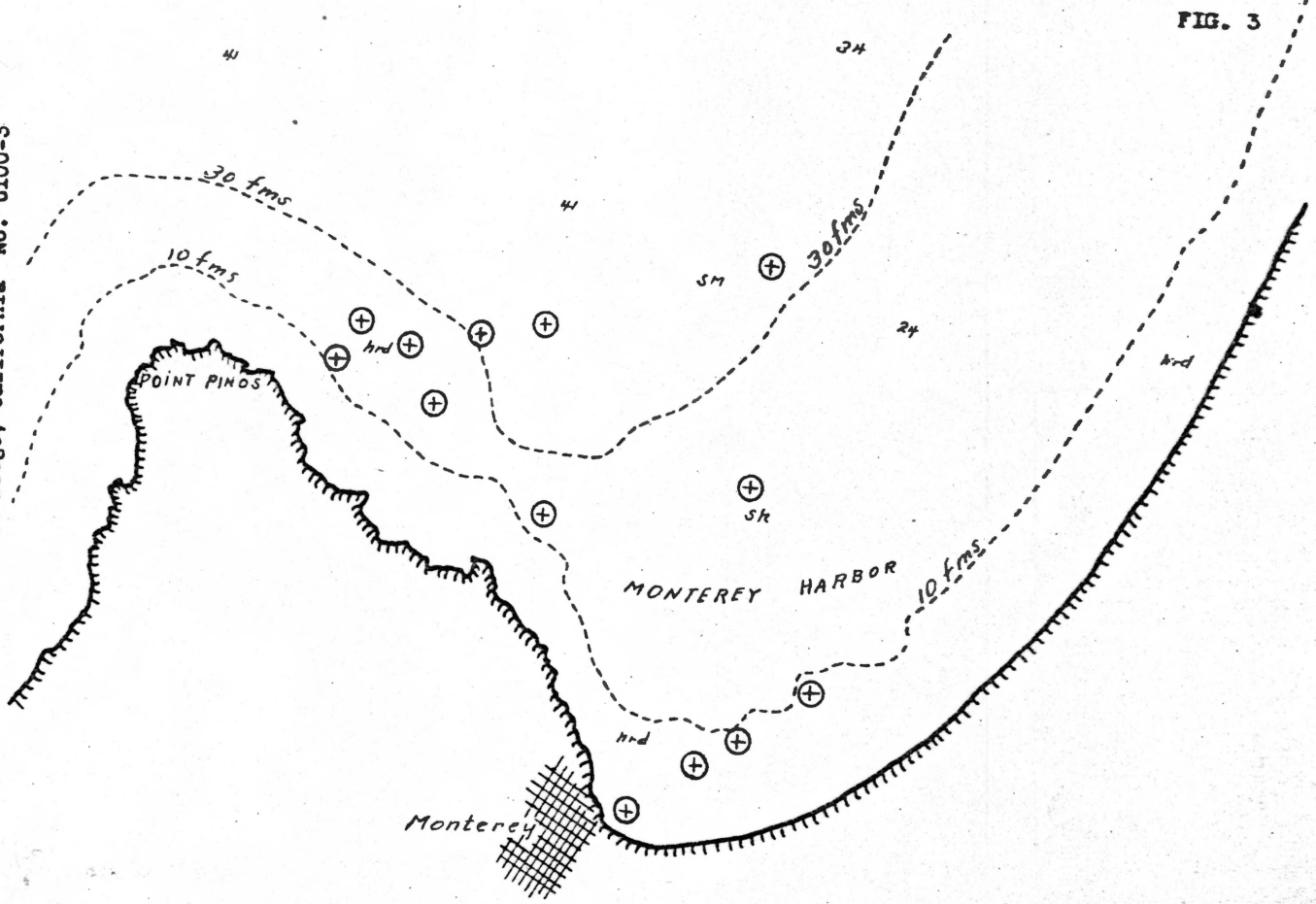
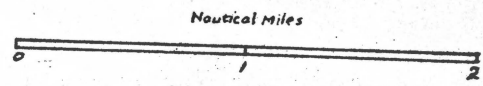


FIG. 3

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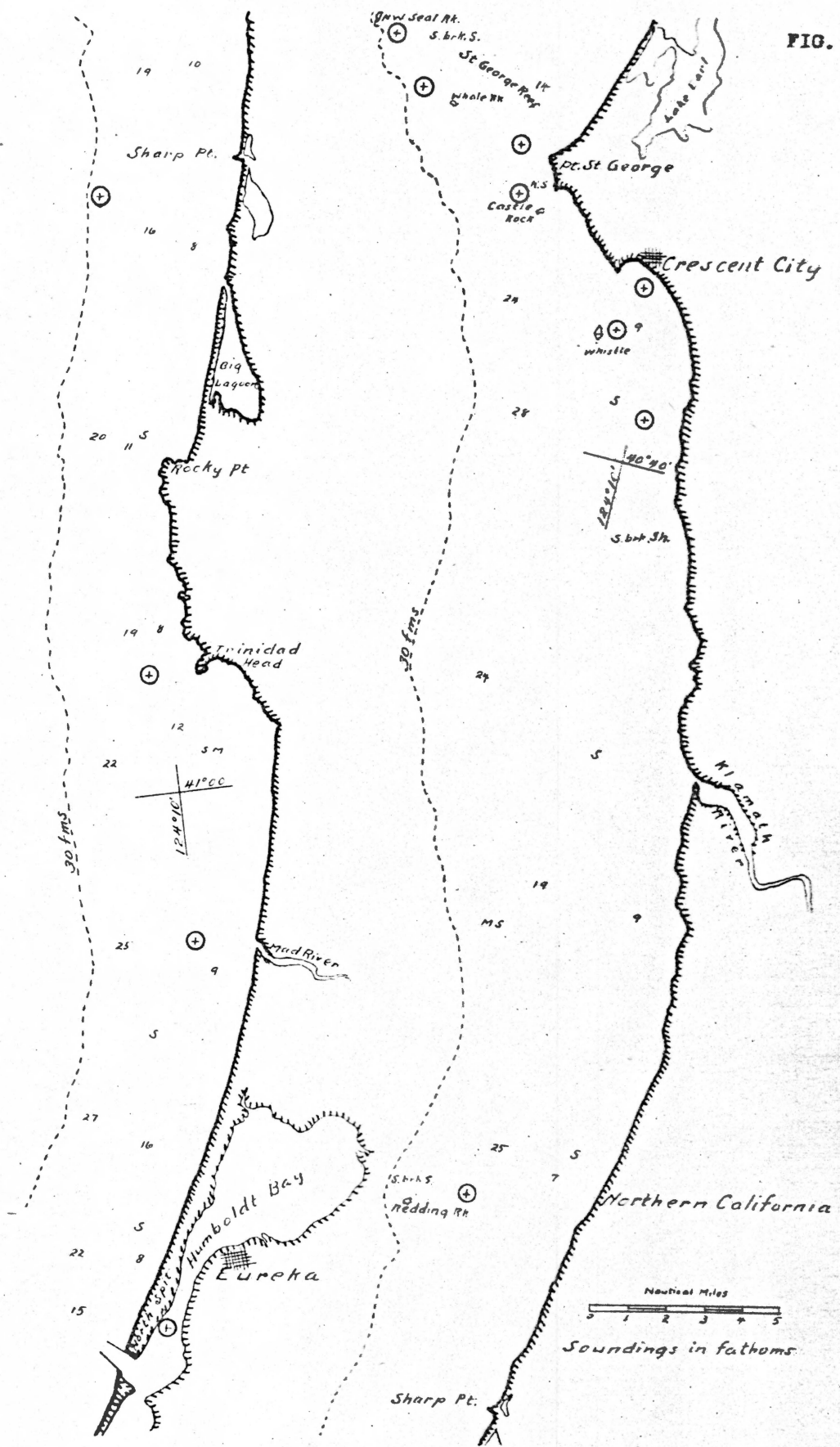
Monterey Bay



Soundings in Fathoms

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FIG. 4



stations. This was true despite the fact that most of the stations were in spots deemed most likely to be inhabited by snapping shrimps. In the harbors at the Eureka Section Base and Crescent City, especially the latter, some weak crackling and occasional loud cracks could be heard when full output of the amplifier was used. These noises no doubt result from crabs or forms other than snapping shrimps. The conclusion is that the whole area is outside the range of the snapping shrimps and this agrees with their known geographical range, since they have not been reported north of Point Reyes in the San Francisco region. In the San Francisco area the surveys of June and November 1942 revealed some crackling evidently resulting from activities of small populations of snapping shrimps (Refs. 2 and 3).

Admiralty Inlet, Port Townsend, Washington

No troublesome crackling noises were noted in this area (Fig. 5). Some very weak crackle could be heard in and at the edge of kelp beds but the whole area surveyed had very favorable listening conditions. The work was carried out from the Port Townsend Section Base which provided a small power launch.

San Juan Archipelago, Puget Sound, Washington

The observations were carried out mainly aboard a Coast Guard patrol vessel based at Friday Harbor. A wide variety of habitats was tested in this area (Fig. 6) which is known to be a biologically rich one. No biologically noisy spots were discovered. Weak crackling and piping noises were heard only in shallow water and within 20 or 30 feet of rocky shores or in the immediate vicinity of kelp beds. As in the Eureka-Crescent City and Admiralty Inlet areas, the noises were weak compared with the intensities found south of San Francisco.

Comparison of conditions with those encountered in Puget Sound last November revealed no detectable seasonal change in noise conditions.

Fish Noises

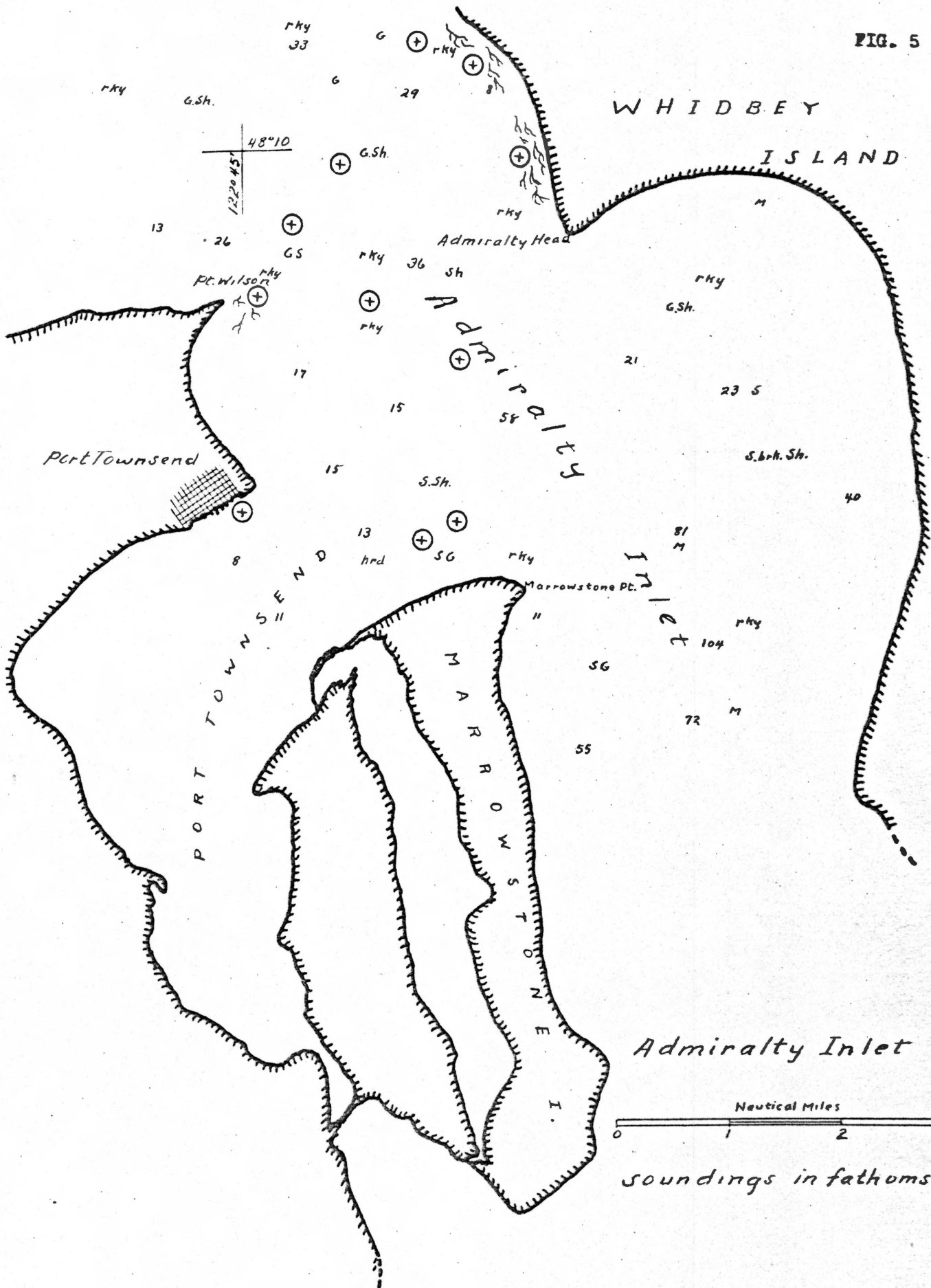
No fish noises were found in any of the regions. Night listening was carried on only near Redding Rock off Northern California and at Port Townsend and Friday Harbor, Washington, and, in view of the known diurnal variation of fish noise, this remark is not as conclusive as might be desired.

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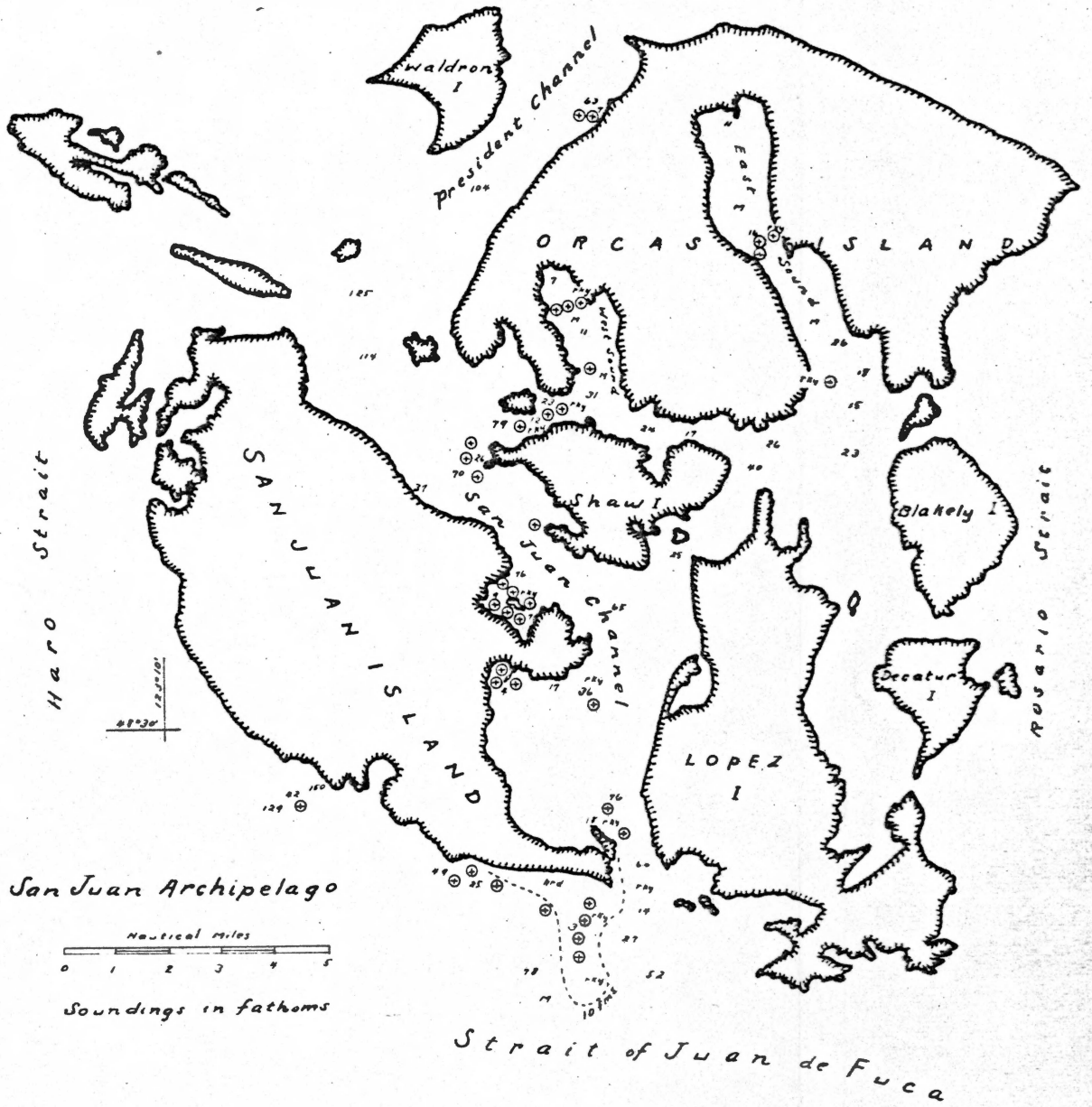
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FIG. 5

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REFERENCES

1. Preliminary Survey of Certain Biological Underwater Sounds on the East Coast of North America, Martin W. Johnson (UCDWR No. U63; May 25, 1943).
2. Water Noise Survey, San Francisco Harbor, F. A. Everest, R. W. Young, G. P. Welch and L. W. Sepmeyer (UCDWR, June 19, 1942).
3. Sound Survey -- San Francisco Harbor (November 1942), Listening Section (UCDWR No. U27; February 3, 1943).

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