

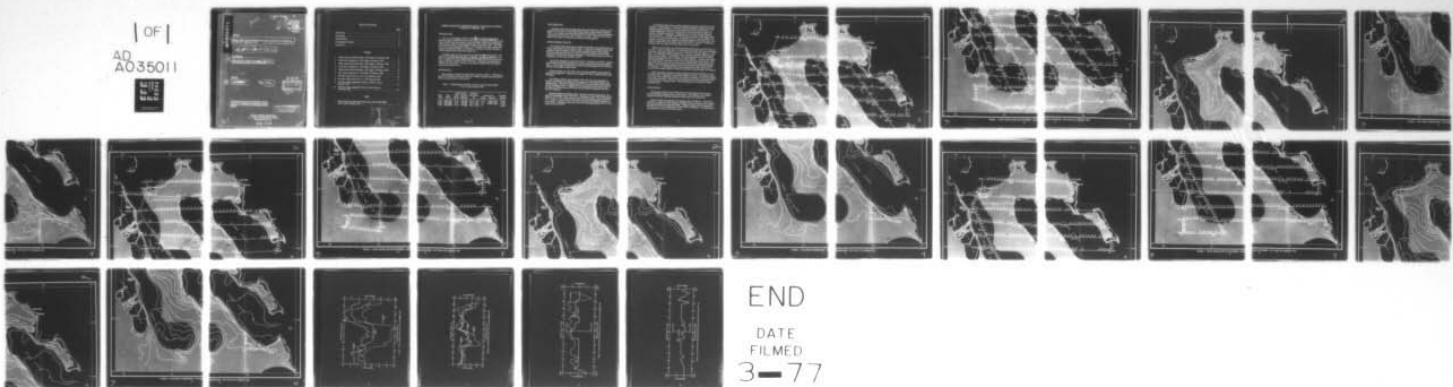
AD-A035 011

NAVAL OCEANOGRAPHIC OFFICE WASHINGTON D C MARINE SC--ETC F/G 8/10  
AIRBORNE RADIATION THERMOMETER SURVEY TONGUE OF THE OCEAN, 5 TH--ETC(U)  
FEB 63 J WILKERSON, R PELOQUIN, I PERLROTH  
NOO-IM-0-20-63

UNCLASSIFIED

NL

| OF |  
AO 35011  
MIC  
FILM



ADA 035011

*Good*

MOST Project - 2

(1)  
D

9  
INFORMAL  
MANUSCRIPT  
REPORT  
NO. 0-20-63  
(REPRINT)

TITLE

6 AIRBORNE RADIATION THERMOMETER SURVEY TONGUE OF THE OCEAN,  
5 THROUGH 9 FEBRUARY 1963.

14 NOO-IM-0-20-63

AUTHOR

10 J. WILKERSON, R. PELOQUIN, I. PERLROTH  
OCEANOGRAPHIC PREDICTION DIVISION

DATE

11 28 FEB 1963

12 45p.

DDC  
REFINED  
DEC 2 1976  
A

This manuscript has a limited distribution, therefore in citing it in a bibliography, the reference should be followed by the phrase UNPUBLISHED MANUSCRIPT.

DISTRIBUTION STATEMENT A  
Approved for public release;  
Distribution Unlimited

MARINE SCIENCES DEPARTMENT  
U. S. NAVAL OCEANOGRAPHIC OFFICE  
WASHINGTON 25, D. C.

*Sp-4*

401 263

*net*

## TABLE OF CONTENTS

	Page
Introduction . . . . .	1
Meteorology . . . . .	1
Data Reduction . . . . .	2
Oceanographic Analysis . . . . .	2
Conclusions . . . . .	3

## FIGURES

1	Flight Tracks and Data Recorded - ART Flight of 5 February 1963 . . . . .	4
2	Sea Surface Temperatures - ART Flight of 5 February 1963 . . . . .	5
3	Flight Tracks and Data Recorded - ART Flight of 6 February 1963 . . . . .	6
4	Sea Surface Temperatures - ART Flight of 6 February 1963 . . . . .	7
5	Flight Tracks and Data Recorded - ART Flight of 9 February 1963 . . . . .	8
6	Sea Surface Temperatures - ART Flight of 9 February 1963 . . . . .	9
7	ART Data Along Track A on 5, 6, and 9 February 1963 . . . . .	10
8	ART Data Along Track B on 5, 6, and 9 February 1963 . . . . .	11
9	ART Data Along Longitudinal Tracks in TOTO on 5 and 9 February 1963 . . . . .	12
10	ART Data Along Longitudinal Tracks in Exuma Sound on 5 February 1963 . . . . .	13

## TABLE

1	Meteorological Conditions Over the Survey Area During Flights of 5, 6, and 9 February 1963 . . . . .	1
---	--	---

DATE	TIME	LAT	LONG	ALT	SPEED	DIRECTION
INSTRUMENTS USED: <span style="float: right;">TYPE OF INSTRUMENT</span>						
NAME OF PILOT: <span style="float: right;">TYPE OF AIRCRAFT</span>						
NAME OF OBSERVER: <span style="float: right;">TYPE OF OBSERVATION</span>						

THIS REPORT IS THE PROPERTY OF THE U.S. GOVERNMENT AND IS TO BE DISTRIBUTED WITHOUT RESTRICTION.

AUTHORITY: *Arthur J. Cole*

REPORT NUMBER: *A*

## AIRBORNE RADIATION THERMOMETER SURVEY TONGUE OF THE OCEAN 5 THROUGH 9 FEBRUARY 1963

### INTRODUCTION

On 5, 6, and 9 February 1963 the Antisubmarine Warfare Environmental Prediction System (ASWEPS) aircraft conducted <sup>were conducted</sup> three flights over the Tongue of the Ocean (TOTO) and Exuma Sound to obtain sea surface temperature measurements with the Barnes Model 14-320 Airborne Radiation Thermometer (ART). The TOTO and Exuma Sound are deep basins (600 to 1,100 fathoms) with steep, sloping sides and are surrounded by shoals (1 to 6 fathoms). A shallow area about 38 miles in width divides the basins along their longest axis.

The flight tracks over the survey area are shown in Figures 1, 3, and 5. The flights of 5 and 9 February were flown in daylight. The flight of 6 February was flown at night. Sea surface temperatures were recorded with the ART from an altitude of 1,500 feet at speeds of 200 to 220 knots. Navigation was performed by LORAN and visual means. Accuracy to the nearest one-half mile was achieved along the grid pattern flown.

### METEOROLOGY

Meteorological conditions for each flight are shown in Table 1. With the exception of prevailing overcast of 5 February, weather conditions remained stable in the survey area during the 5-day period.

Table 1 Meteorological conditions over the survey area during flights of 5, 6, and 9 February 1963

Date 1963	Time (GMT)	Surface Winds		Sea State		Cloud Cover		Visibility (miles)
		Speed (knots)	Direction (degrees)	Wind (ft)	Waves (ft)	(10ths)	Base (ft)	
5 Feb	1300-2100	8-10	240-280	1/3 to 1-2/3	1/3 to 1-2/3	0-10	1,600-3,500	10-30
6 Feb	2245-0500	8-10	240-280	1/3 to 1-2/3	1/3 to 1-2/3	0-5	2,000-2,500	10-30
9 Feb	1300-2000	8-10	240-280	1/3 to 1-2/3	1/3 to 1-2/3	0		15-30

## DATA REDUCTION

Continuous strip chart recordings taken during the flights were averaged to the nearest  $0.5^{\circ}\text{F}$  for each 1-minute interval (equivalent to approximately 4 nautical miles). The average values were plotted along the flight path, and surface temperature contours were drawn for each  $1^{\circ}\text{F}$  (Fig 2, 4, and 6). Contours of  $0.5^{\circ}\text{F}$  were added in some areas to accentuate the features of weak gradients.

## OCEANOGRAPHIC ANALYSIS

On 5 February (Fig 2) pronounced temperature gradients were found between the TOTO, Exuma Sound, and the shallow waters. A large area of relatively cool water southeast of New Providence Island extended southward along the 77th meridian. The core of this cool water lay over the area of shallowest water with the lowest temperature ( $69.5^{\circ}\text{F}$ ) near Cochrane Anchorage. In the southern portion, the lowest temperature was  $70^{\circ}\text{F}$  near  $24^{\circ}12'\text{N}$ ,  $77^{\circ}\text{W}$ .

Sea surface temperature varied  $0.5^{\circ}\text{F}$  ( $72.5^{\circ}$  to  $73.0^{\circ}\text{F}$ ) in the TOTO. Temperature changes were pronounced along the transition zones between deep and shallow water. A narrow band of relatively cool water was found adjacent to the TOTO and parallel to the length of Andros Island.

In Exuma Sound, as in the TOTO, there was little variability and temperatures generally averaged  $73^{\circ}\text{F}$ . Temperatures averaged  $1^{\circ}\text{F}$  lower in shallower water near the islands.

On 6 February (Fig 4), the orientation of the cool water mass observed on 5 February had changed only slightly with exception of a small eastward shift in the southern sector. Sea surface temperatures of  $69^{\circ}\text{F}$  were measured east and southeast of New Providence Island. It appears that the temperatures in this cooler water on the night of 6 February were  $0.5^{\circ}\text{F}$  lower than the minimum measured in the same area on 5 February.

Maximum temperature gradients ( $4^{\circ}\text{F}$  in 20 miles) occurred in the shallow water along the northeastern sector of the TOTO. Temperature in the TOTO varied approximately  $0.5^{\circ}$  to  $1.0^{\circ}\text{F}$ , while maximum variation in the channel of Exuma Sound was  $1^{\circ}\text{F}$ . As above, a narrow band of cool water was observed immediately adjacent to Andros Island. Temperatures observed in this water were approximately  $1.0^{\circ}$  to  $1.5^{\circ}\text{F}$  cooler than in the TOTO.

On 9 February (Fig 6) the sea surface temperature pattern varied little from the patterns of 5 and 6 February. However, horizontal temperature gradients were significantly greater between areas of warm deep water and cool shallow water. A minimum temperature of 66°F was measured east of New Providence Island in the vicinity of Cochrane Anchorage. Temperatures in the TOTO averaged between 72.5° and 73.0°F. Transition zones between deep and shallow waters again delineated the warm and cool water masses. As recorded on the two previous flights, decreases in temperatures were observed immediately adjacent to the island area. Temperature varied little in the southern sector of the TOTO. However, a temperature increase of 2°F was observed in the northern sector 6 hours later.

Figures 7 and 8 compare the ART data obtained along tracks A and B in Figures 1, 3, and 5. Track A (northern sector of TOTO and Exuma Sound) shows that the strongest sea surface temperature gradients occurred on 9 February as shown in Figure 7. However, it is noteworthy that the position of the water masses changed little during the three successive flights. On 9 February, the maximum gradient was 4°F in 6 miles, whereas the gradient was 3°F in 12 miles on 5 and 6 February. A similar cross section was constructed for the southern sector of the TOTO and Exuma Sound (Fig 8). Positions of the various warm and cool water masses exhibited little change during the 3 flights. Surface temperature gradients were most pronounced again during the flight of 9 February. It is notable that the minimum temperatures along tracks A and B occurred on the daytime flight of 9 February rather than during the night of 6 February.

Figure 9 compares temperatures along longitudinal tracks of the TOTO on 5 and 9 February 1963. Temperatures are generally higher on the 9th. The gradient is positive to the south on both days; however, the change with distance is not as well defined on the 5th as on the 9th. Figure 10 is the temperature plot along a longitudinal track in Exuma Sound on 5 February 1963. Surface temperatures are relatively constant along this track.

## CONCLUSIONS

The synoptic analyses of the TOTO and Exuma Sound indicate little change in surface temperature patterns during a 5-day period. The alignment of sea surface temperature patterns with deep and shallow water areas is also noteworthy.

Diurnal variation in temperature was detected only on 9 February. This diurnal variation is probably not large enough to completely eliminate the sea surface temperature gradients observed during these flights. Observed maximum diurnal temperature increase was 2°F in the northern sector of the TOTO on 9 February. No measurements were repeated in areas of cool shallow water.

78°

77°

25°

24°



76°

75°

ELEUTHERA

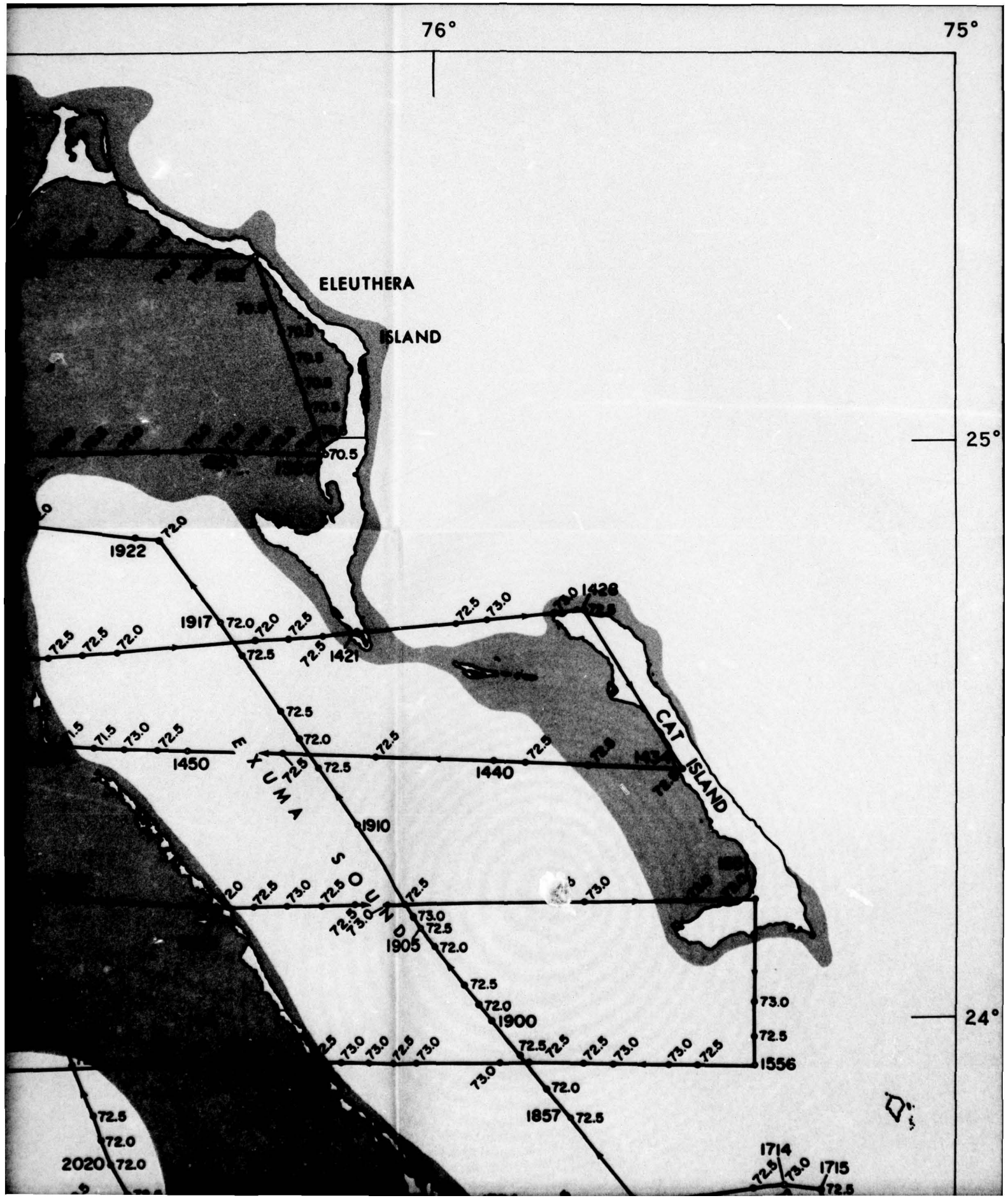
ISLAND

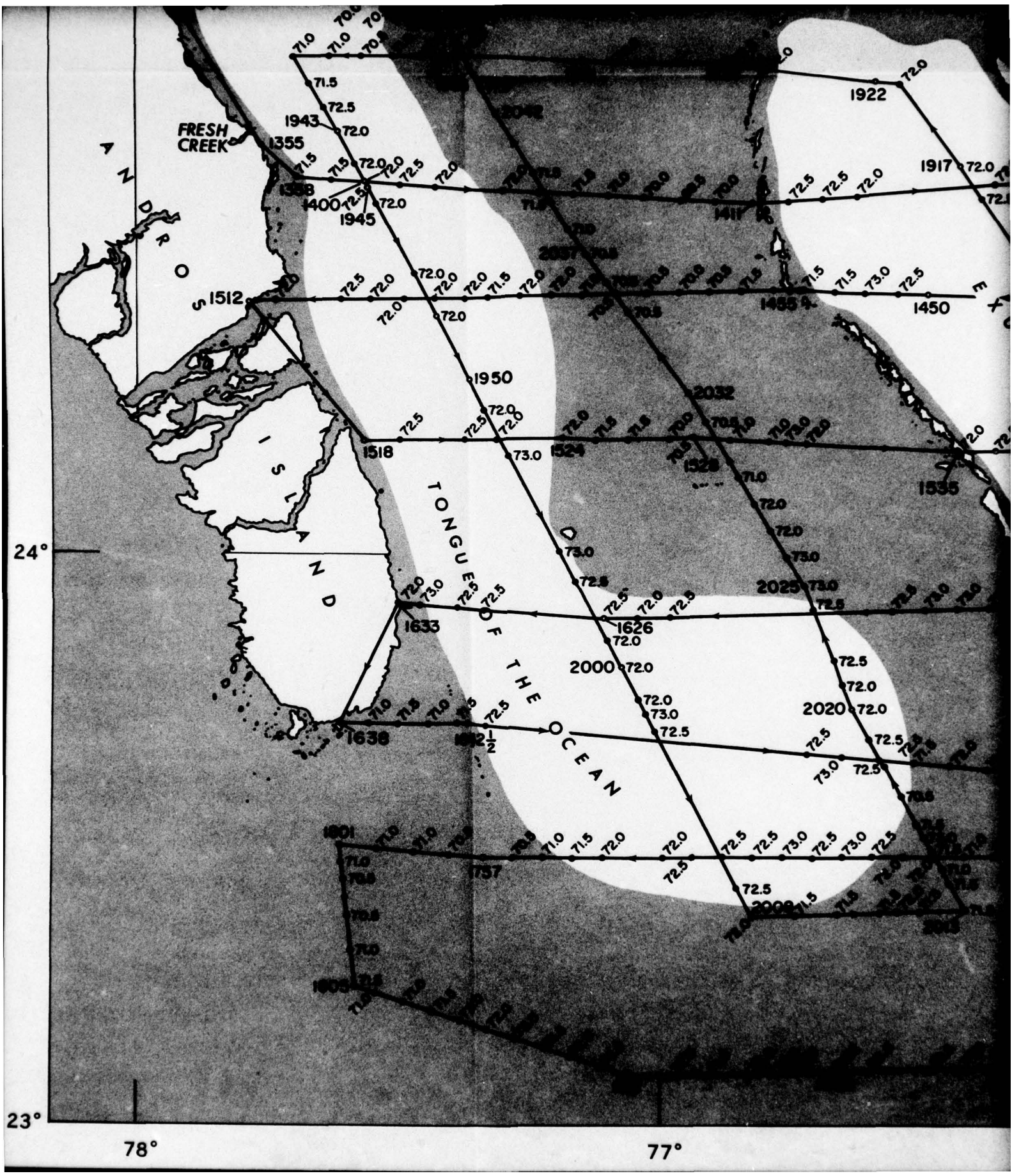
25°

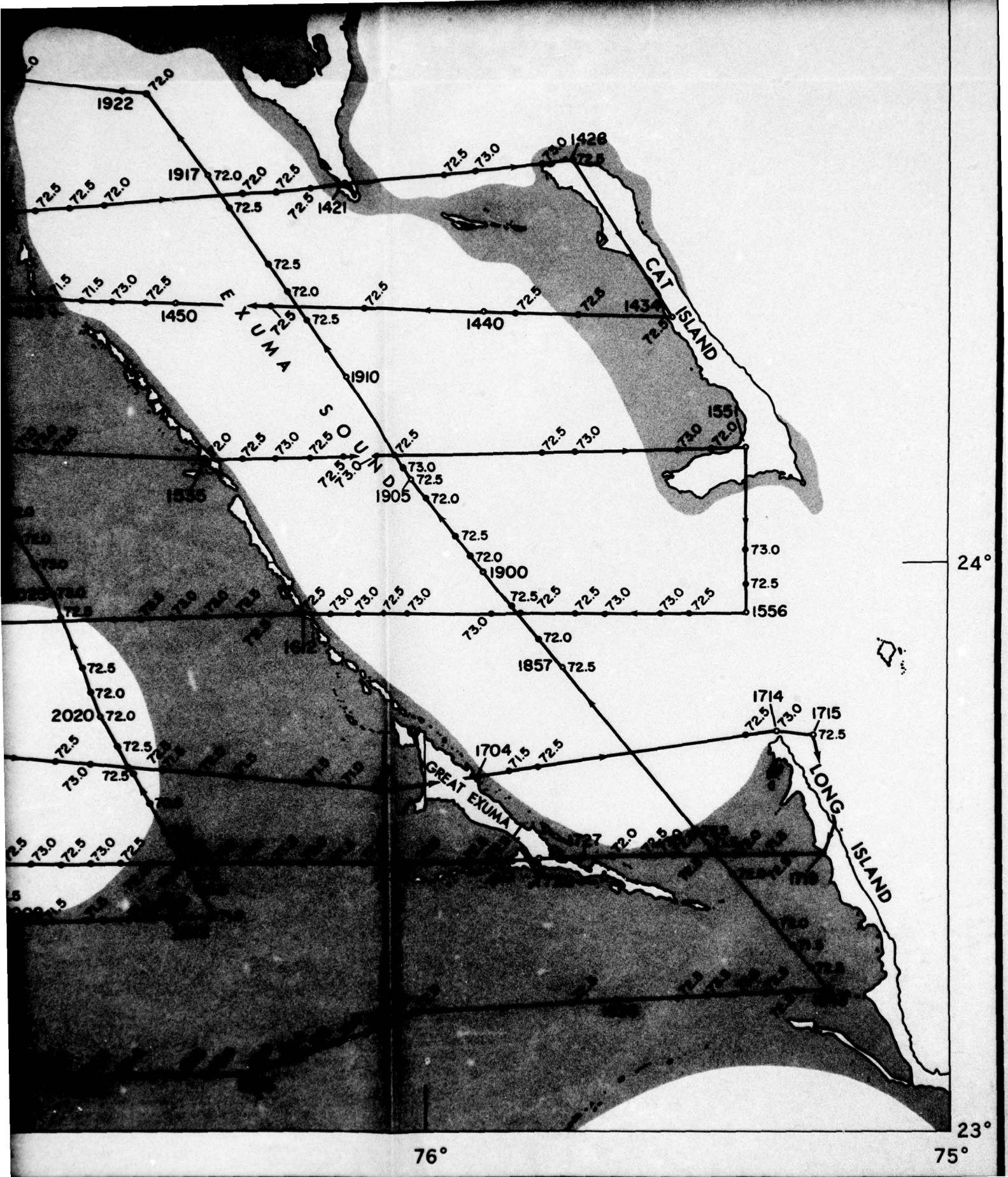
X  
C  
U  
M  
A

C  
A  
T  
I  
S  
L  
A  
N  
D

24°





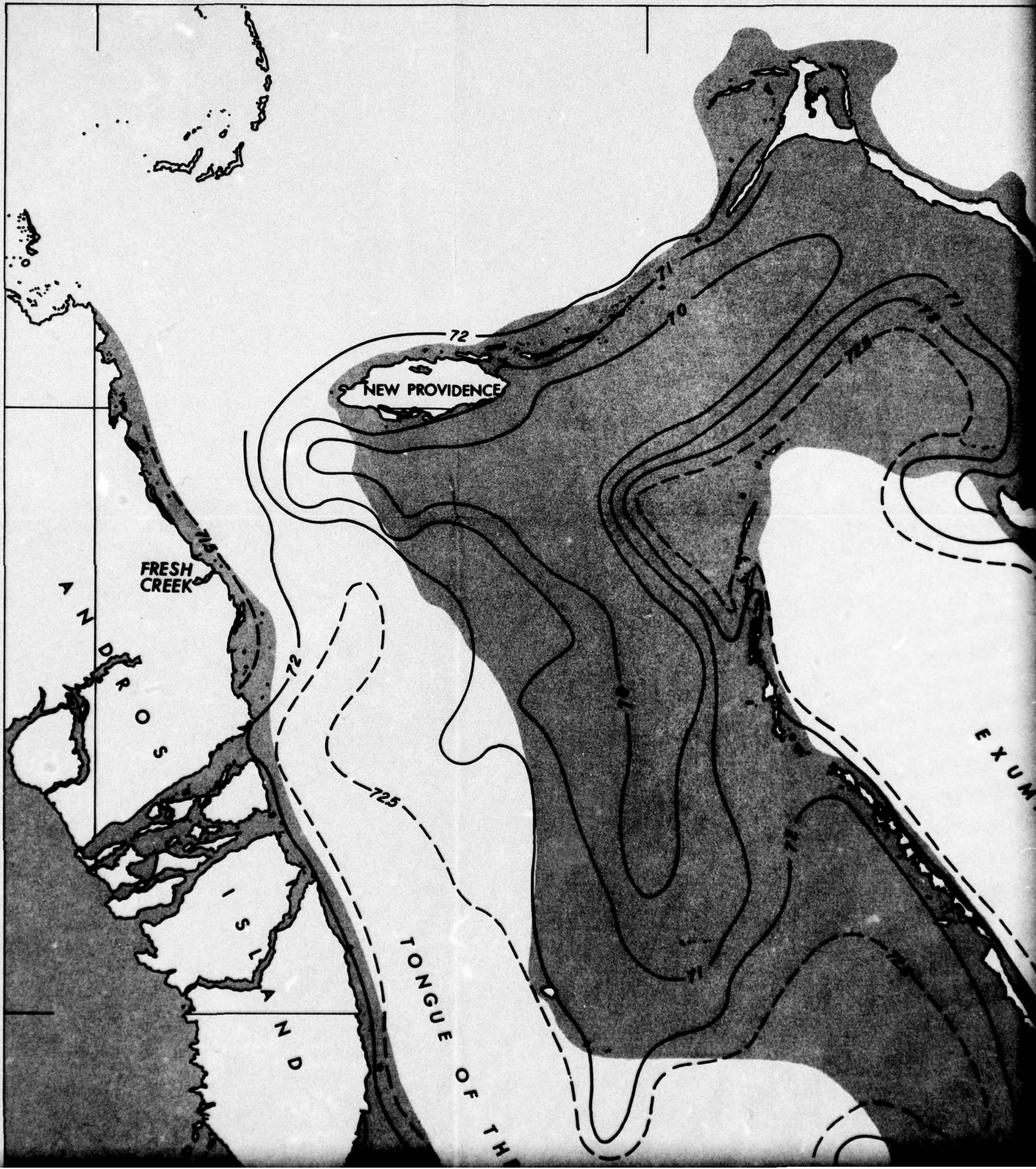


78°

77°

25°

24°



FRESH CREEK

NEW PROVIDENCE

TONGUE OF THE

EXUM

76°

75°

ELEUTHERA

ISLAND

25°

72

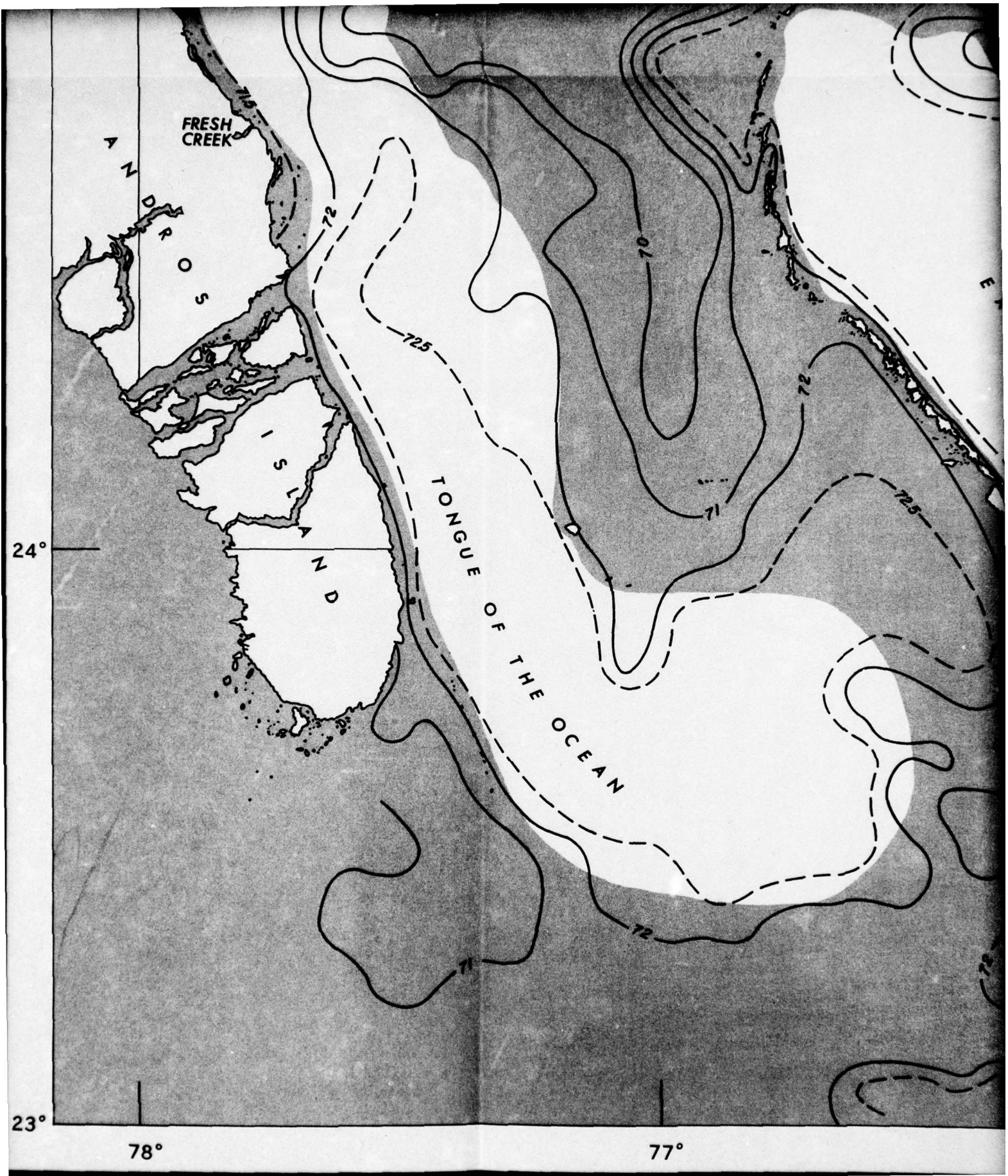
72.5

CAT ISLAND

EXUMA  
SOUND

24°





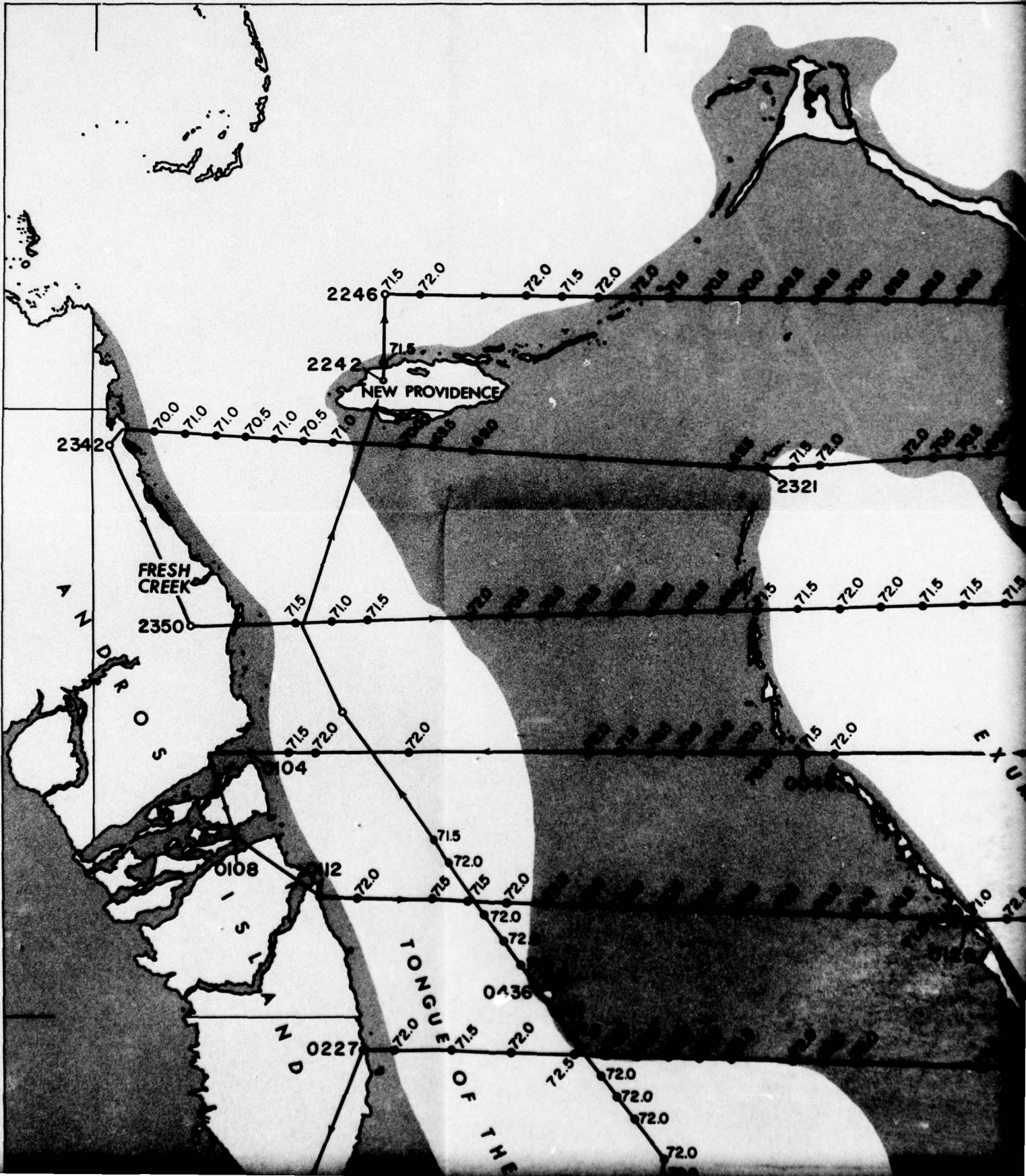


78°

77°

25°

24°



76°

75°

ELEUTHERA

ISLAND

2305

2310

2321

0012

0020

0024

0025

E  
X  
U  
M  
A  
  
S  
O  
U  
N  
D

CAT  
I  
S  
L  
A  
N  
D

0144

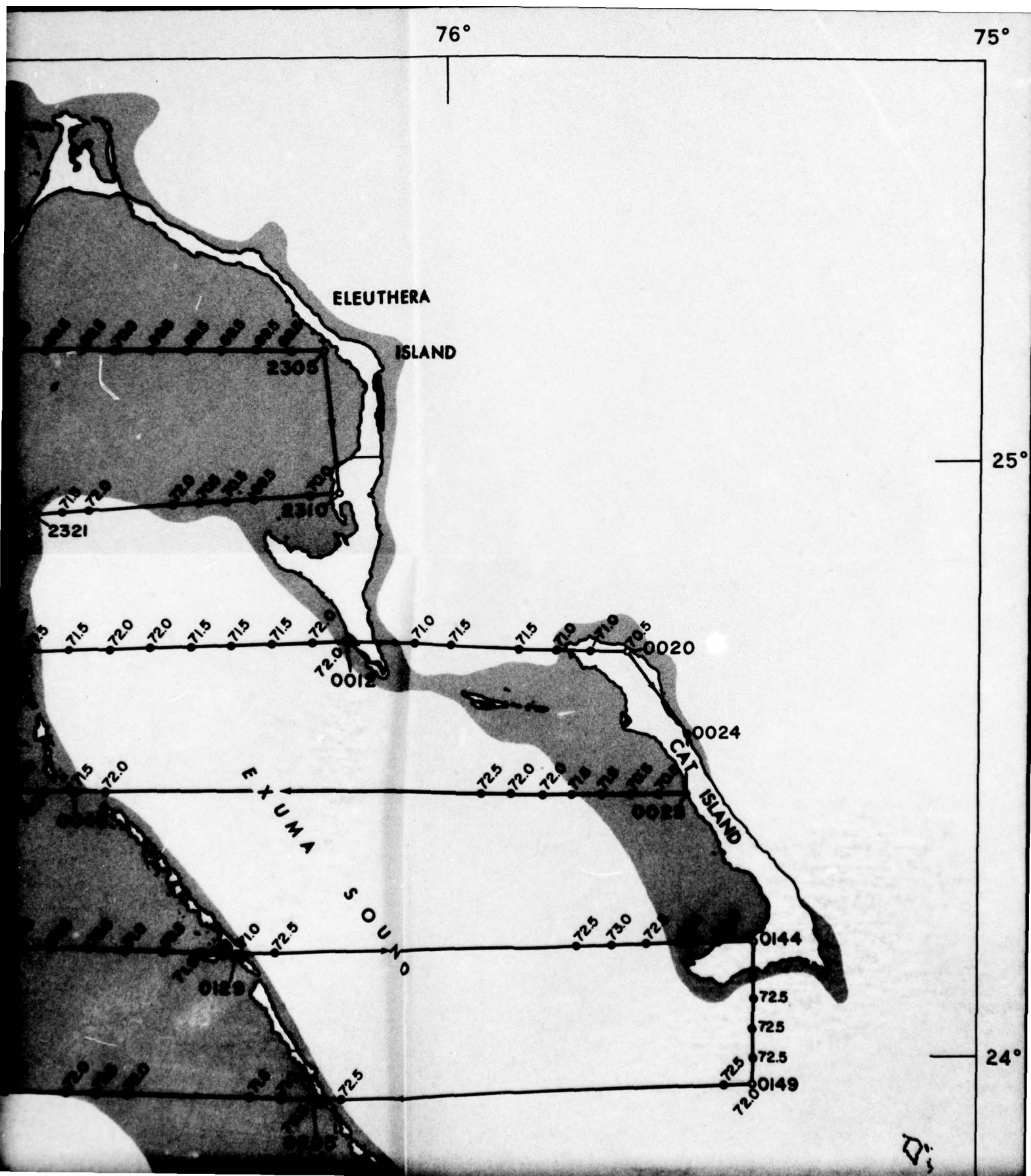
0129

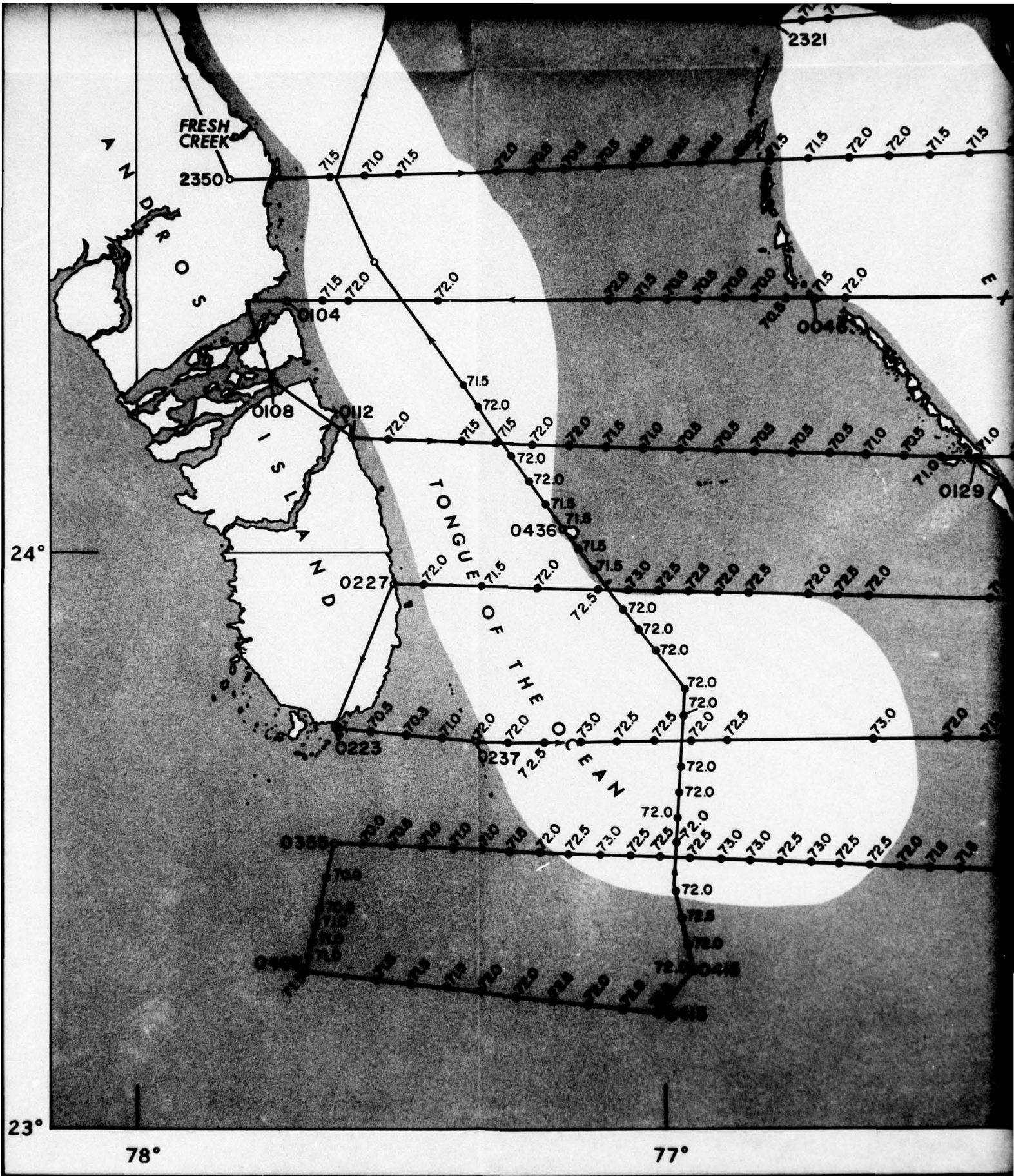
0149

25°

24°

D:







78°

77°

25°

24°



NEW PROVIDENCE

FRESH CREEK

AZORES

ISLAND

TONGUE

72.5 FATHOMS

EX

76°

75°

ELEUTHERA

ISLAND

25°

72

72.5

71

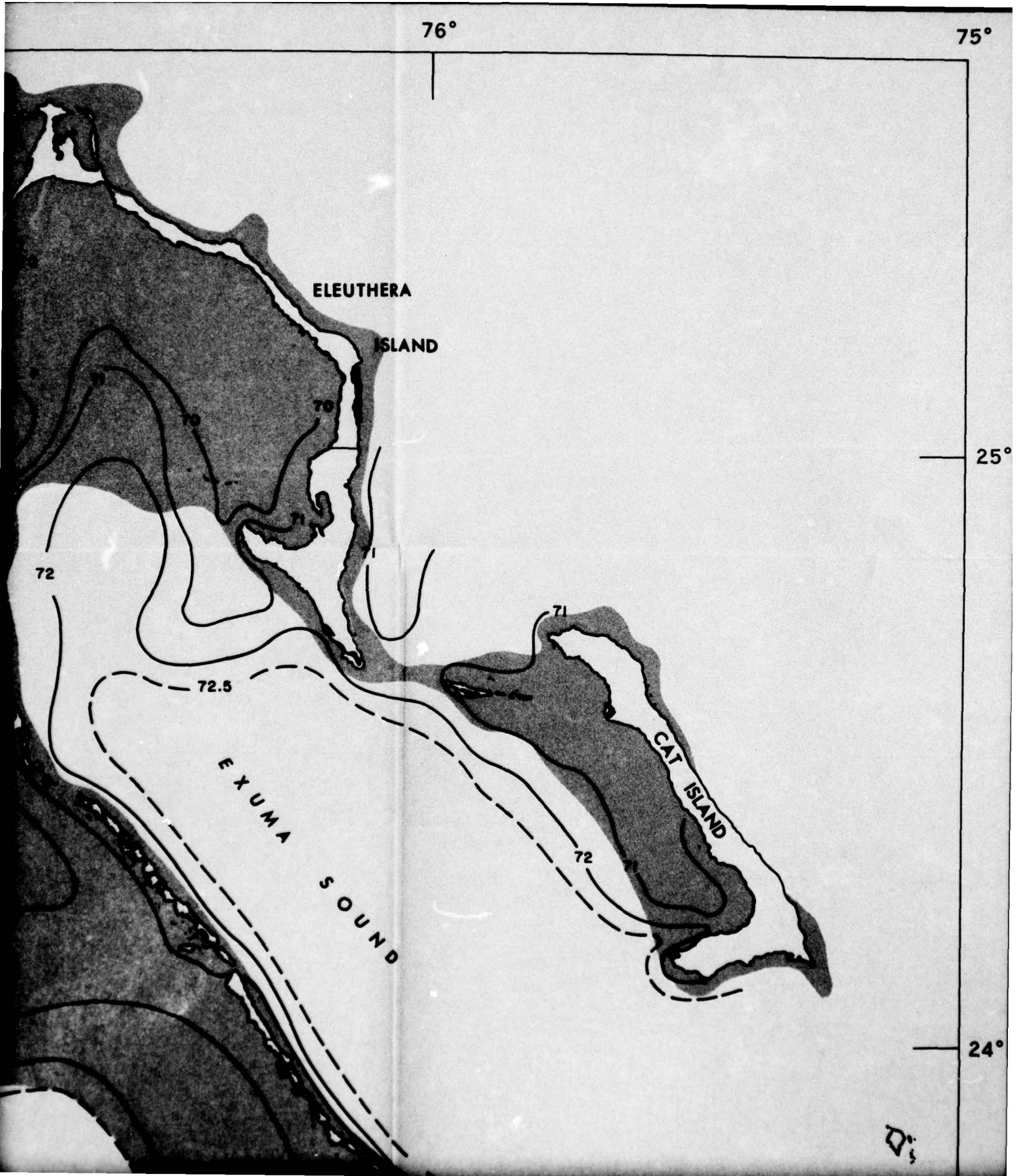
EXUMA  
SOUND

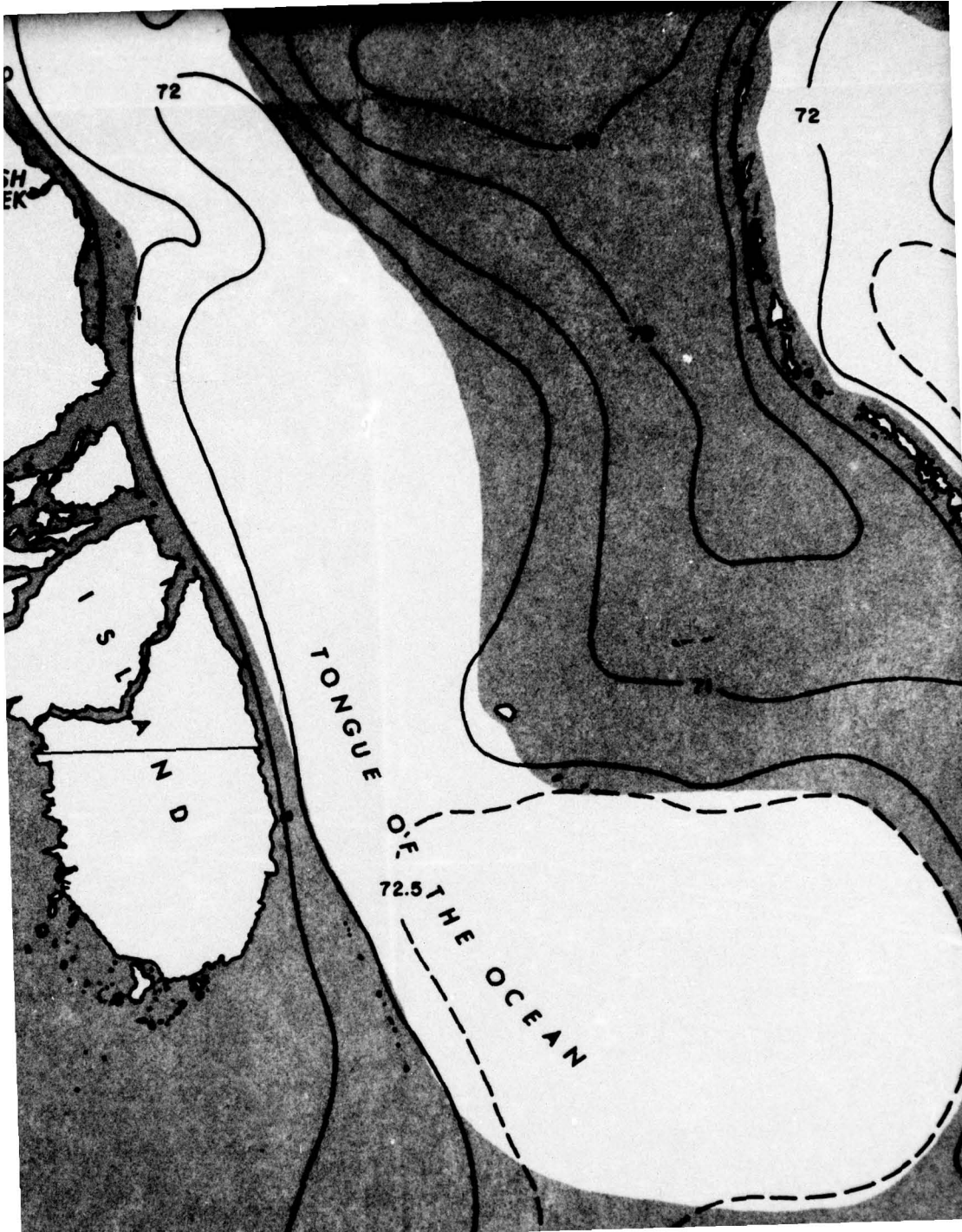
CAT  
ISLAND

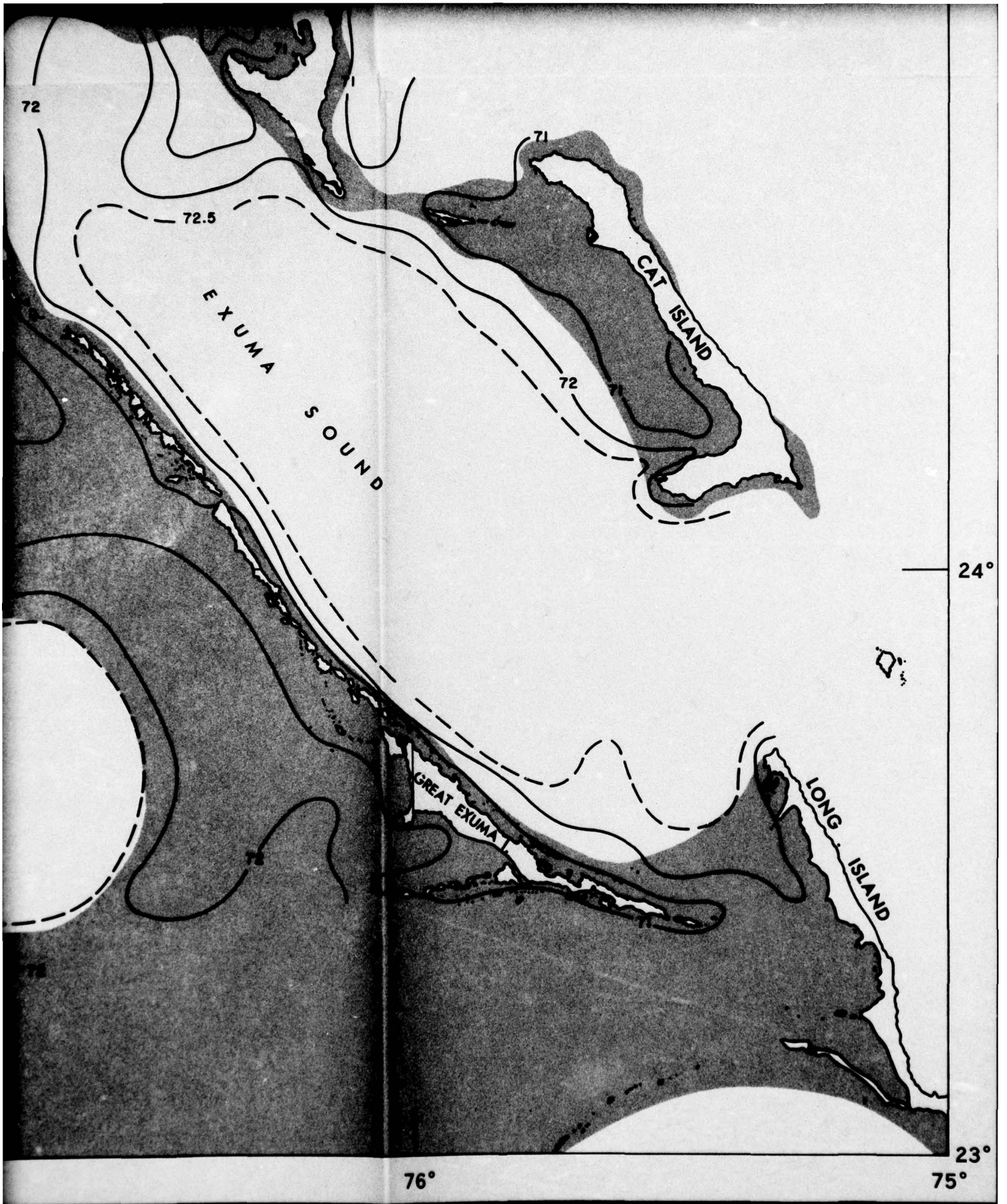
72

24°

D<sub>3</sub>





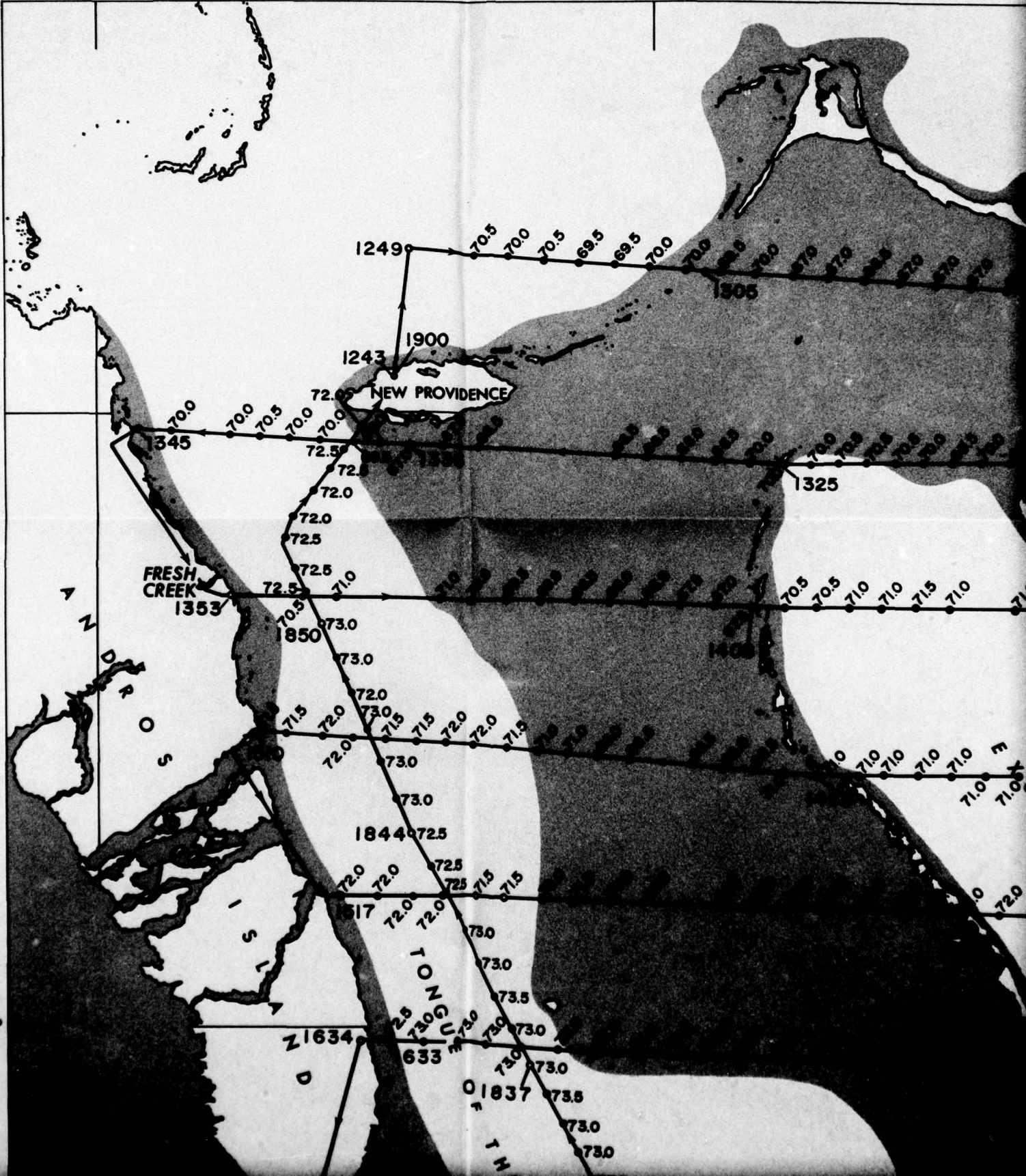


78°

77°

25°

24°



76°

75°

ELEUTHERA ISLAND

1308

1325

25°

1419

1427

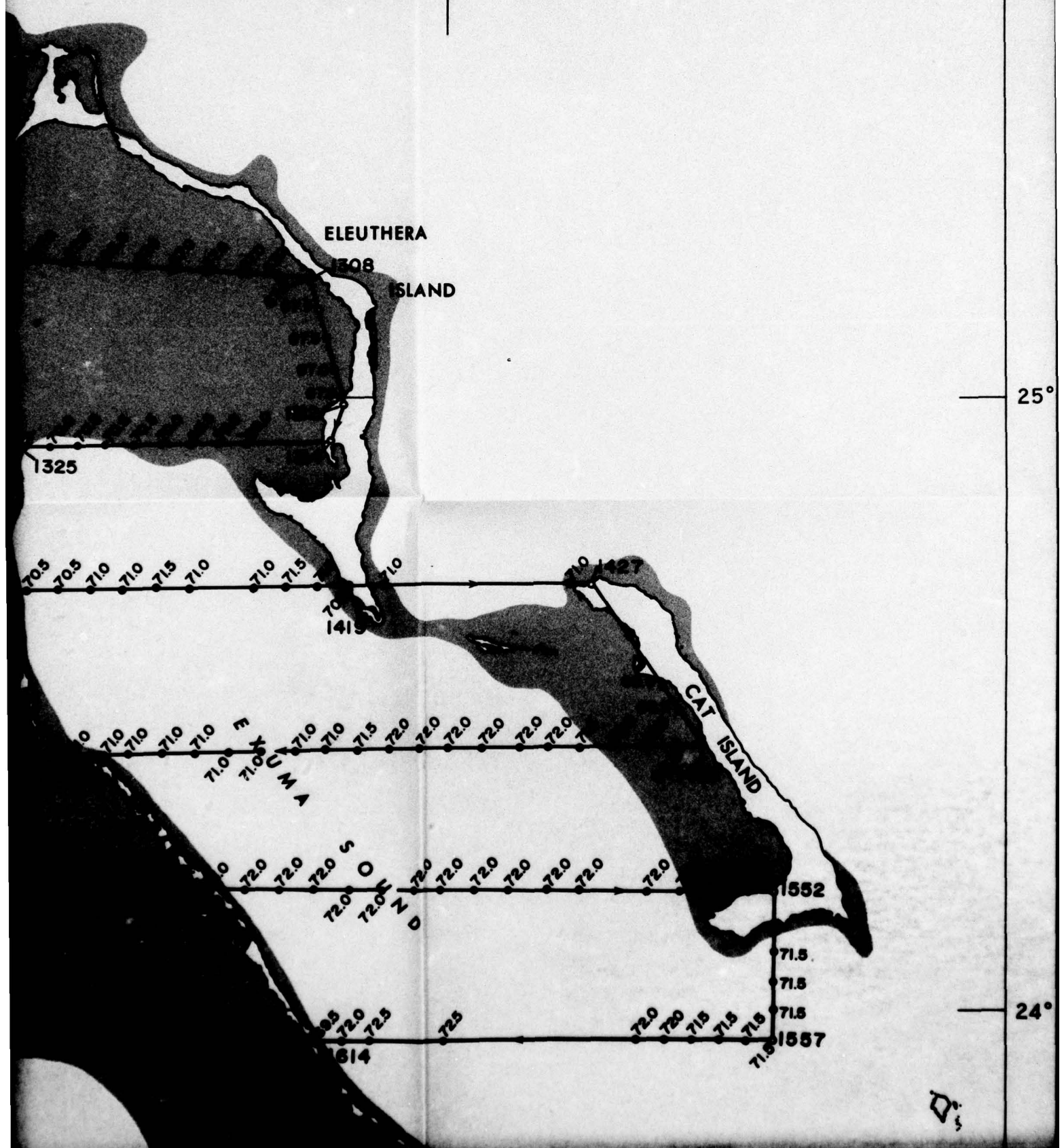
CAT ISLAND

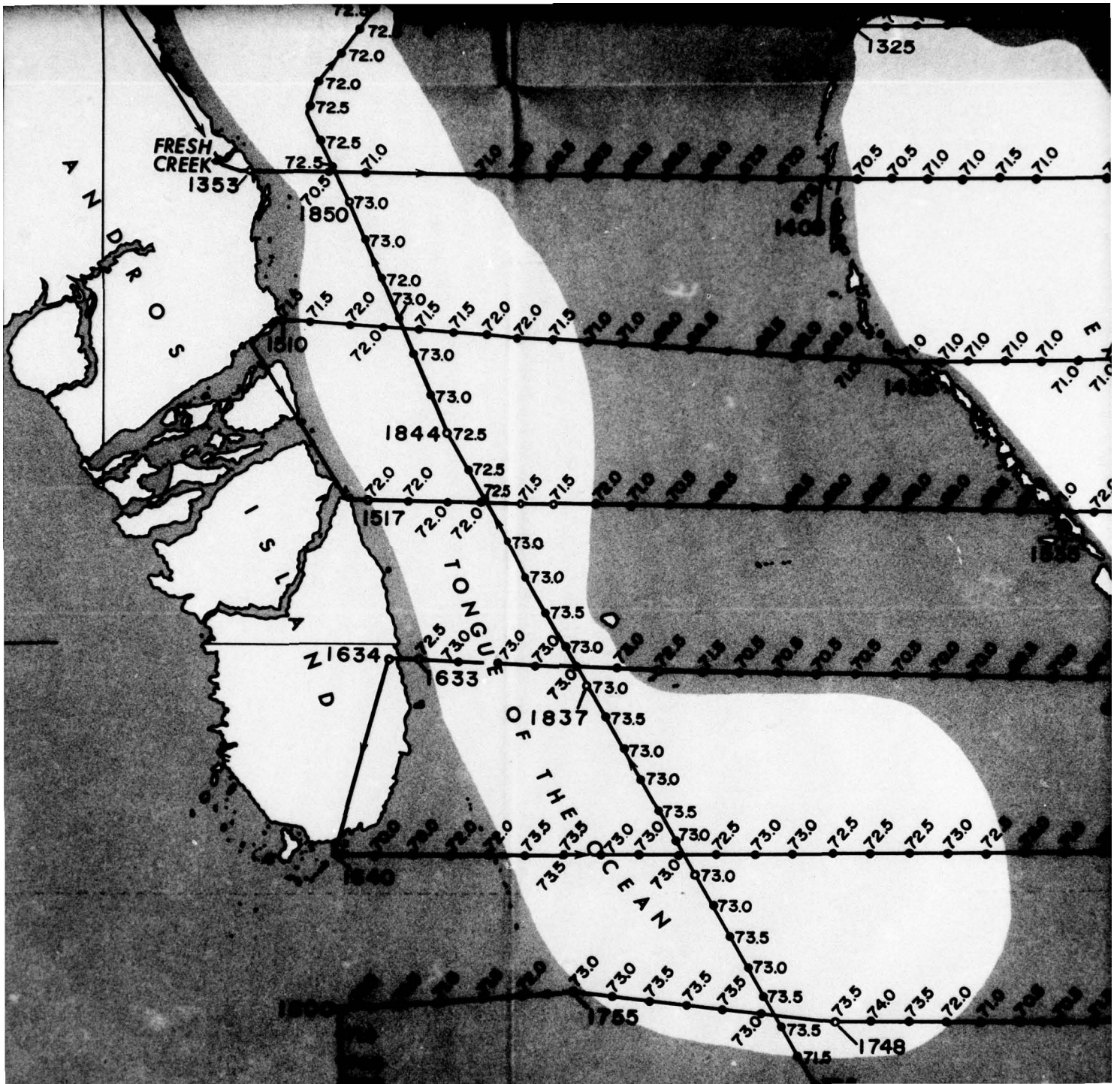
1552

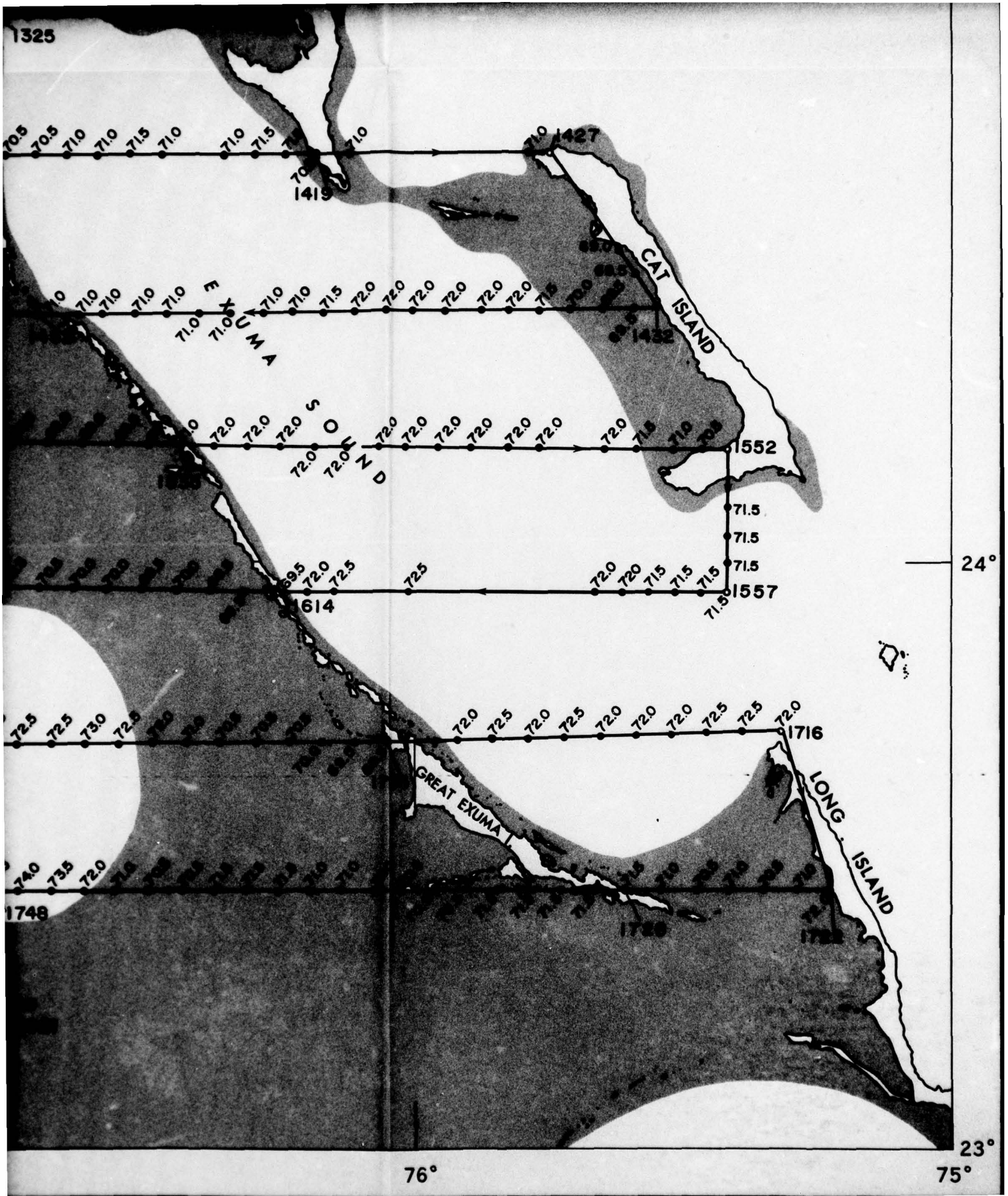
24°

1614

1557







78°

77°

25°

24°



76°

75°

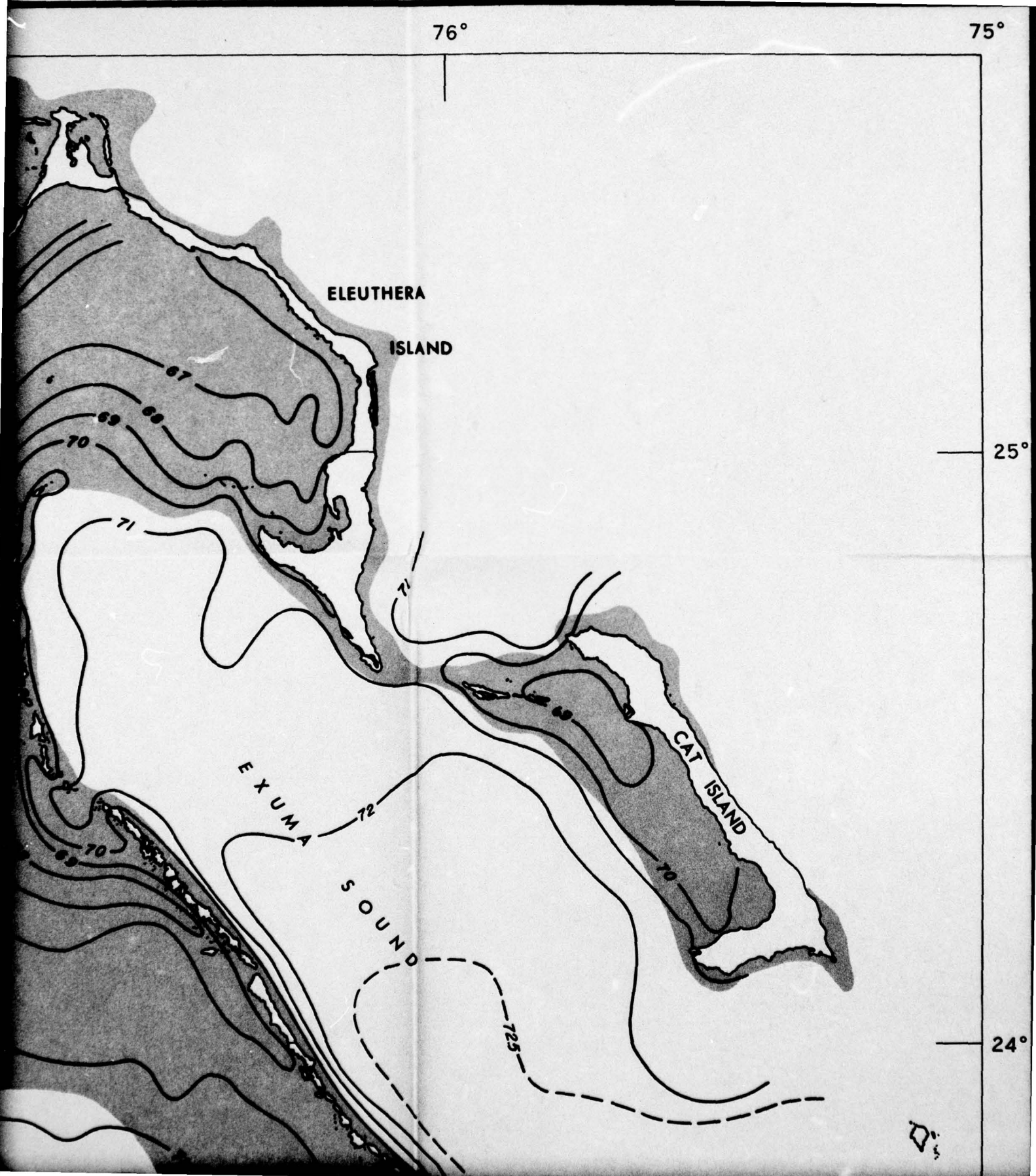
ELEUTHERA  
ISLAND

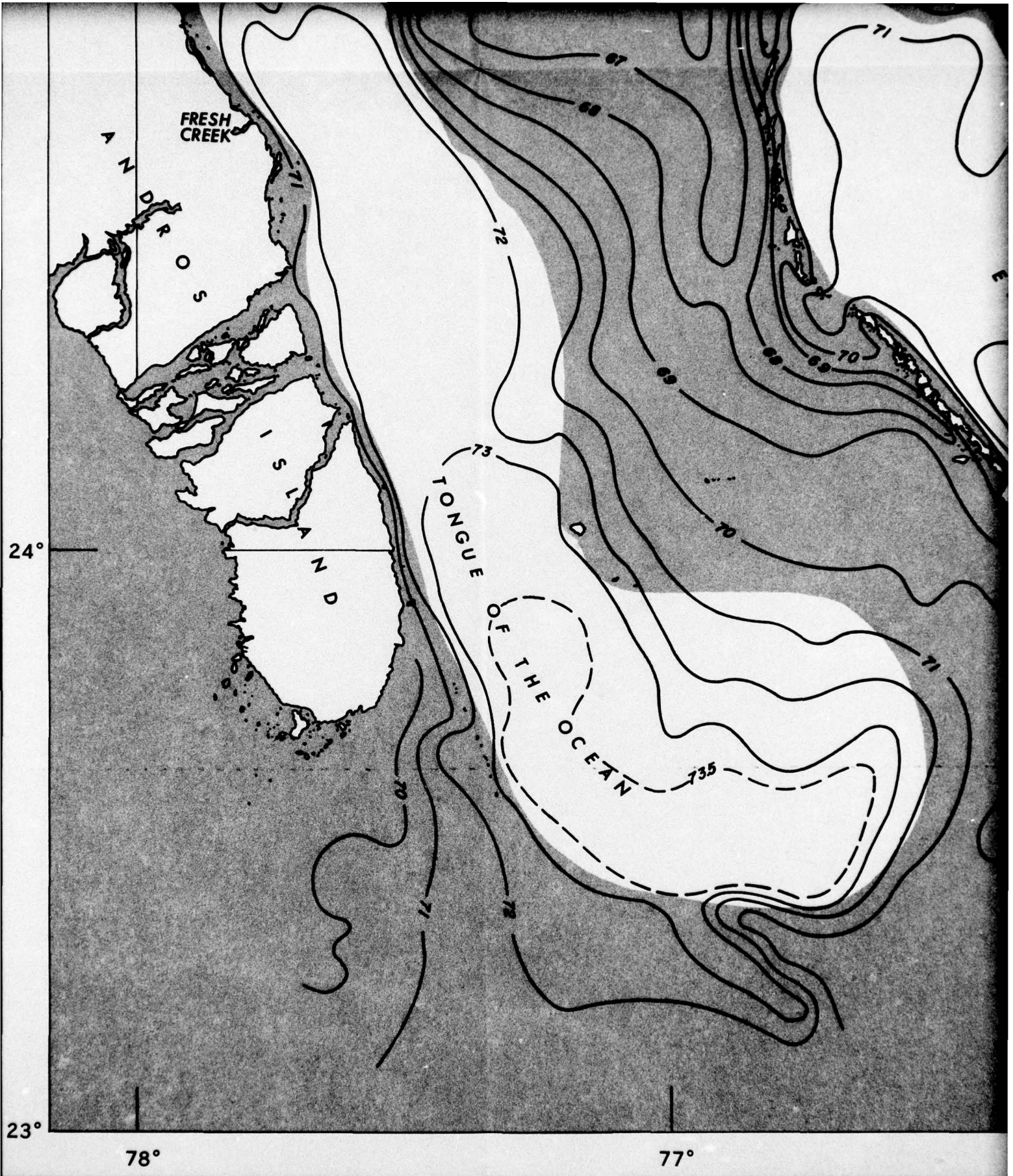
25°

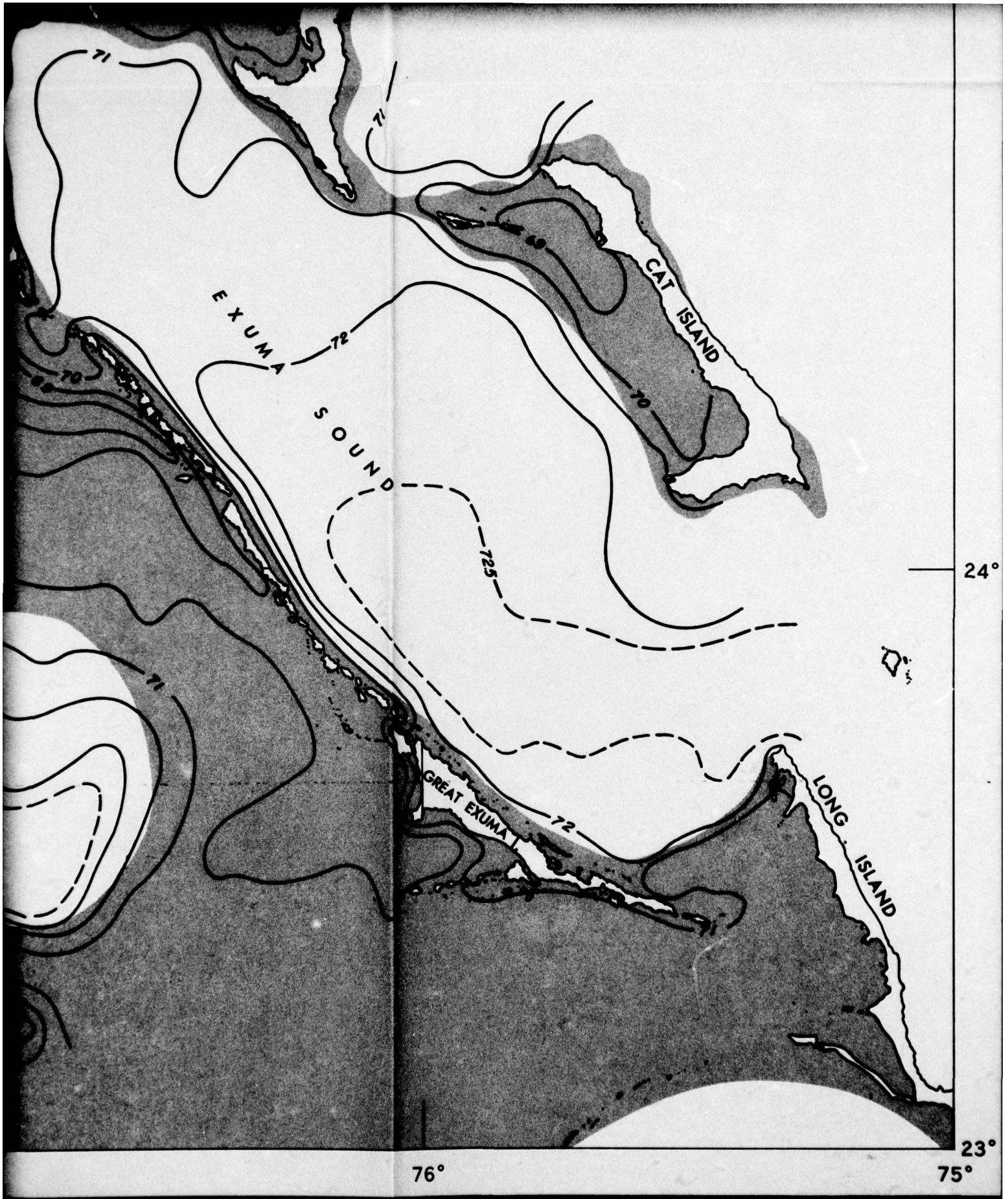
CAT ISLAND

EXUMA  
SOUND

24°







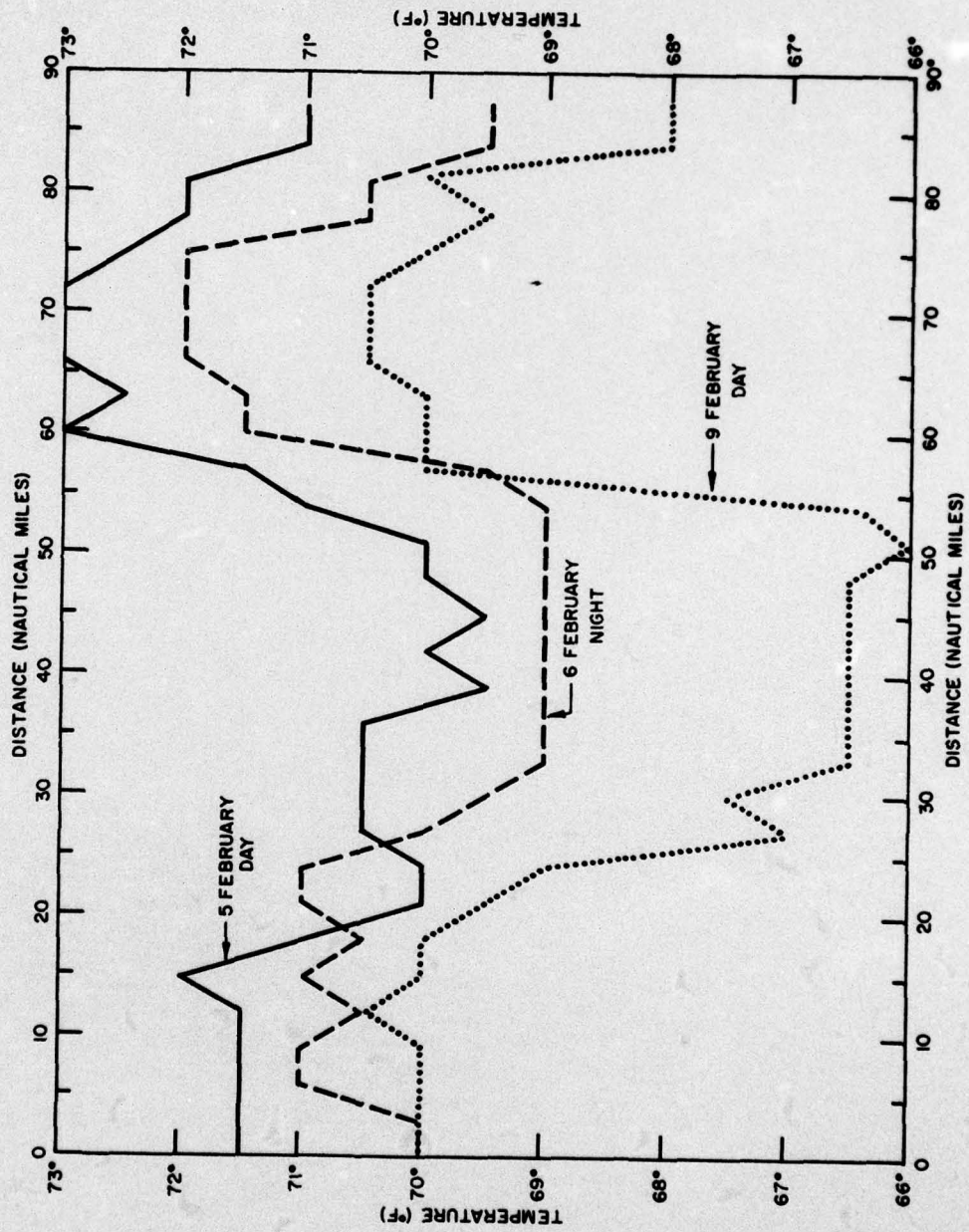


FIGURE 7 ART DATA ALONG TRACK A ON 5, 6, AND 9 FEBRUARY 1963

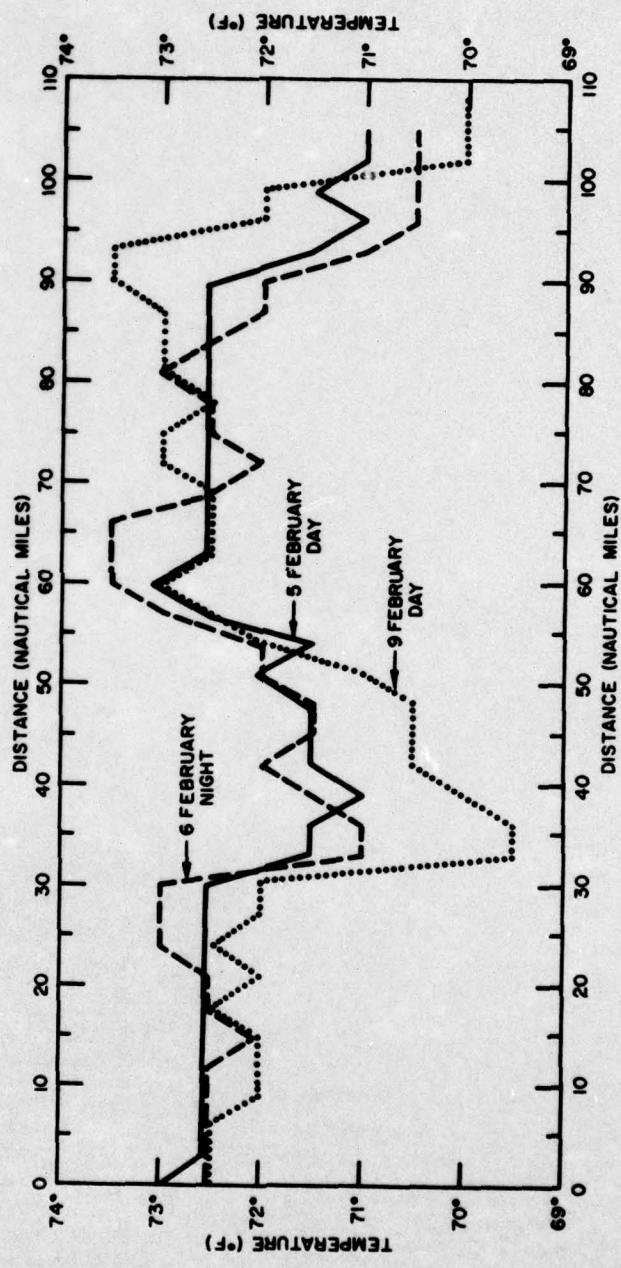


FIGURE 8 ART DATA ALONG TRACK B ON 5, 6, AND 9 FEBRUARY 1963

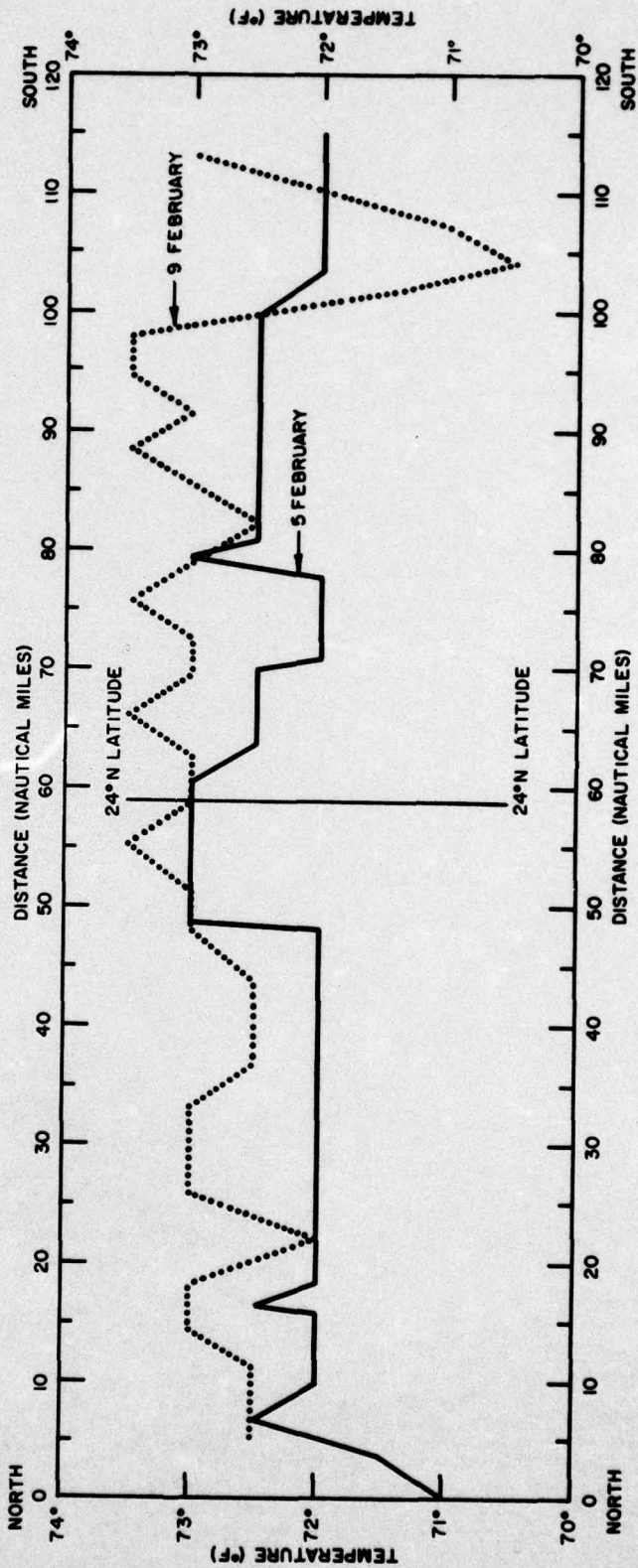


FIGURE 9 ART DATA ALONG LONGITUDINAL TRACKS IN TOTO ON 5 AND 9 FEBRUARY 1963

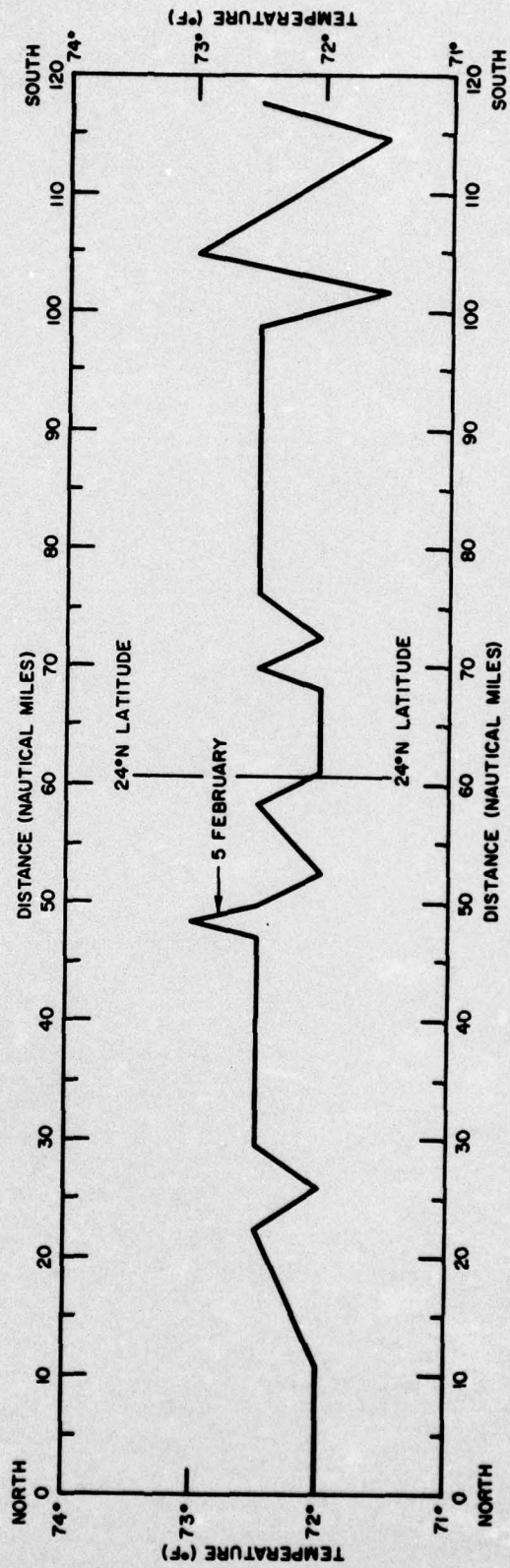


FIGURE 10 ART DATA ALONG A LONGITUDINAL TRACK IN EXUMA SOUND ON 5 FEBRUARY 1963