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SURVEY OF SEA STRAIT DATA AROUND JAPAN. CRUISE TRACKS BY JAPANE--ETC(U)

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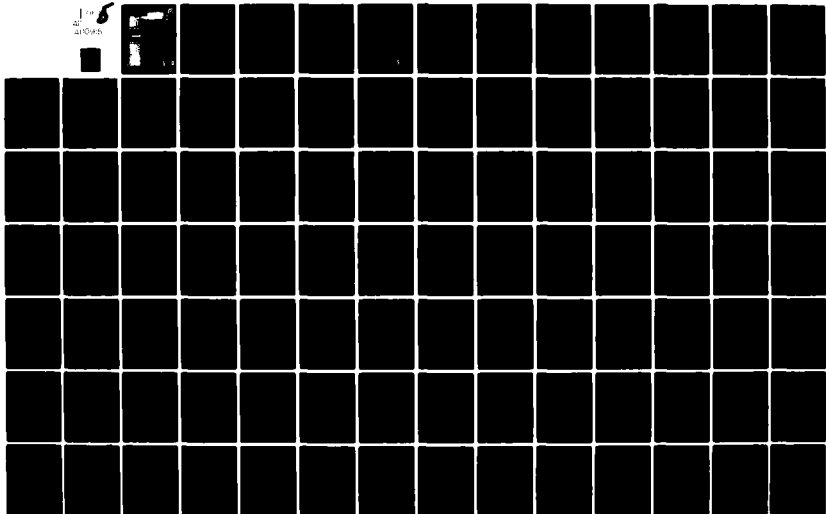
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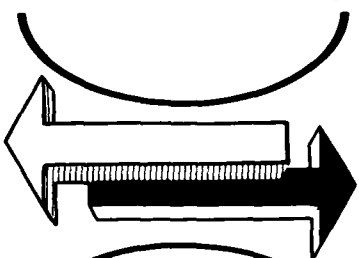


SSR-2

TECHNICAL REPORT NO. 1

CONTRACT ONR N00014-80-C-0039
TEKMARINE PROJECT TCN-003

SEA STRAITS



RESEARCH

SURVEY OF SEA STRAIT DATA AROUND JAPAN

CRUISE TRACKS BY JAPANESE AGENCIES

APPENDIX 1: JAPAN HYDROGRAPHIC OFFICE

APPENDIX 2: JAPAN FISHERIES AGENCY

APPENDIX 3: JAPAN METEOROLOGICAL AGENCY

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Survey of Sea Strait Data Around
Japan.

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DESCRIPTIVE NOTE: Technical rept. Dec 79-Nov 80,
JUL 81 312P Sonu, Choule J. ;
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UNCLASSIFIED REPORT

ABSTRACT: In order to consolidate existing
oceanographic data relating to the Tsushima,
Tsugaru and Soya Straits, various data sources
have been investigated and the results compiled into
the cruise inventory data base of 'Oceanographic
Environmental Reference Service' system of
NAVOCEANO. As of this report, a total of 2,025
cruises by Japanese data collectors have been
inventoried. (Author)

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DESCRIPTORS: *Straits, *Oceanographic data, Japan,
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IDENTIFIERS: Tsushima Strait, Tsugaru Strait,
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) In order to consolidate existing oceanographic data relating to the Tsushima, Tsugaru and Soya Straits, various data sources have been inves- tigated and the results compiled into the cruise inventory data base of "Oceanographic Environmental Reference Service" system of NAVOCEANO. As of this report, a total of 2,025 cruises by Japanese data collectors have been inventoried.		

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20. Abstract (Cont'd)

The purpose of this study is to provide (1) data directory information on the three Japanese sea straits to managers and planners, and (2) a referral guidance for those who wish to access or retrieve data. For this purpose, in addition to compiling an OERS data base, the report provides an extensive descriptive oceanography and an annotated bibliography. It also includes three appendices giving cruise track charts by the Japan Hydrographic Office, the Japan Fisheries Agency, and the Japan Meteorological Agency.

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Mrs. Anina Gadd, Ms. Christina Somu and Mr. Yutaka Ochi spent many dedicated hours in preparing the figures and tables and otherwise performing numerous chores for the report. The author's acknowledgements are also due to Mrs. Toni Simms of Tekmarine who was responsible for typing, editing and collating the report.

Choule J. Somu

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APPENDIX 1

CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE

APPENDIX 1

Cruise Tracks by Japan Hydrographic Office

Introduction

Included in this appendix are the serial oceanographic survey cruise tracks which have been occupied by the survey vessels of the Japan Hydrographic Office since pre-war years. Also included are other pertinent information which, together with the cruise tracks, would enable an investigator to quickly assess the extent of data available at a region of interest as well as the data reports in which such data can be accessed. For a complete tabulation of JHO cruise information on file with the NAVOCEANO OERS (Oceanographic Environmental Reference Service), see Table 3-2 in the text.

The Japan Hydrographic Office (called "Suiro-Bu" in Japanese) is a branch of Maritime Safety Agency under Ministry of Transport. It came into being as far back as 1871 as a branch of the Japanese Navy and remained so till the end of WW II. The JHO oceanographic data prior to 1945 are relatively sparse. Among the few interesting survey activities during this period were bathymetric and tidal surveys in Tsushima Strait in 1876 and a 24-hour tidal current measurement in Tsugaru Strait in 1931.

In 1948, the JHO was incorporated as a civilian service into Maritime Safety Agency of Ministry of Transport and began to broaden its functions as one of the primary oceanographic data collectors in Japan along with the Japan Meteorological Agency and the Fisheries Agency.

Among the principal functions of the JHO are:

- o Bathymetric charting and navigational advisory.
- o Geodetic services.
- o Oceanographic surveys and research.
- o Oceanographic data inventory.

The Japan Oceanographic Data Center (JODC) is located within the JHO.

Physical oceanographic parameters of particular interest to the JHO are:

- o Temperature and salinity.
- o Currents.
- o Tide.
- o Wave.
- o Sea ice.

In particular, the JHO has traditionally maintained keen interest in currents. The JHO far outdistances the other two agencies in terms of the volume of GEK data. According to a survey taken by the JODC in 1981, the number of GEK stations taken by these agencies between 1953 through 1979 was as follows:

JHO	79,111 stations
JMA	37,021 stations
JFA	12,995 stations

In general, the number of GEK stations taken by the JHO exceeds that by the JMA by a rough 2 : 1 ratio throughout all the regions around Japan.

The amount of oceanographic data collected by JHO, as well as by the JMA and the JFA, made a quantum jump around 1954. This year also coincides with the time when the three agencies began coordinating their data collection activities through a joint coordinating committee ("Three-Agency Oceanographic Liaison Committee). The coordinating committee holds scheduled meetings to coordinate administrative functions and technical workshops.

JHO Cruises

The JHO maintains extensive networks of cruise tracks throughout the entire regions surrounding Japan. Typical cruise tracks are shown in Figure A1-1. In addition to occupying these established tracks on regular schedule, the JHO engages in occasional surveys away from home waters in the Pacific Ocean and in foreign waters. One such recent survey was bathymetric and tidal current studies in the Malacca Strait in 1969.

Oceanographic cruises by the JHO are performed by both the headquarters in Tokyo and a total of eleven local offices in various regions of the country. Locations and jurisdictional divisions of these various regional offices are shown in Figure A1-1 and Table A1-1. Of these various regional offices, those which are routinely engaged in the surveys at Tsushima, Tsugaru and Soya Straits are as follows:

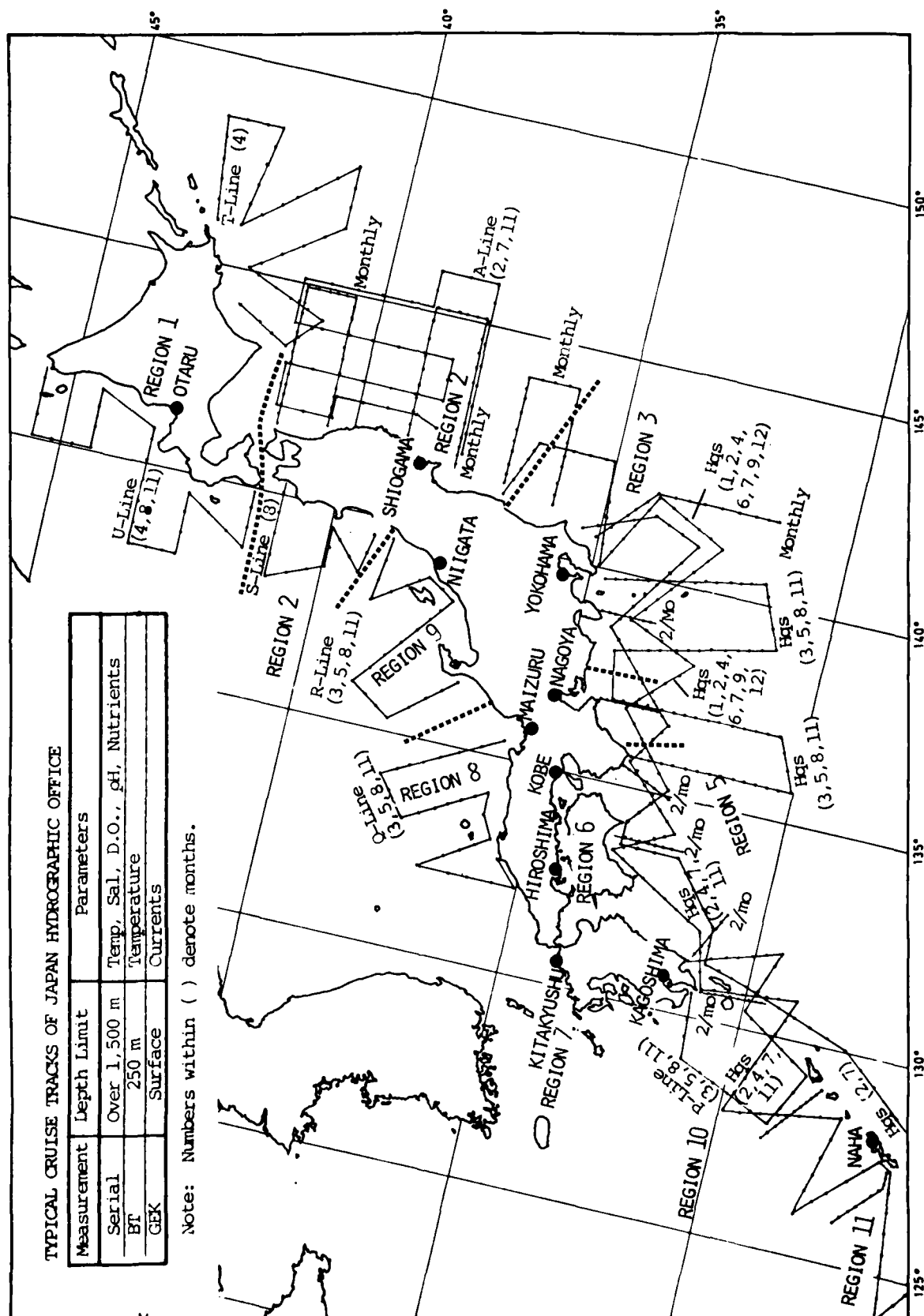


Figure A1-1. Typical Cruise Track by Japan Hydrographic Office.
(Courtesy of J.O.D.C.)

<u>Region</u>	<u>Hqs</u>	<u>Sea Strait</u>
1	Otaru	Tsugaru Soya
2	Shiogama	Tsugaru
7	Kitakyushu	Tsushima
8	Maizuru	Tsushima*

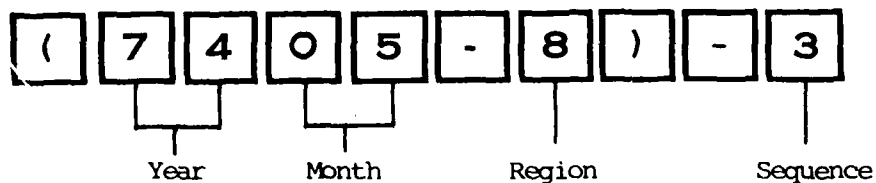
(*) Downstream of Tsushima Strait.

Included in this appendix are the cruise tracks which have been occupied by JHO since 1932, updated to 1976, the last year for which the published cruise tracks are available. The tracks away from Japanese home waters have been excluded.

Annotations

Cruise Number:

The JHO cruise tracks are assigned a cruise number code consisting of five or six digits, such as



The first two digits denote the data year, followed by another two digits denoting the data month in the ascending order of 01 through 12 for January through December. These are followed by one or two digits, the fifth and sixth, 0 through 11, denoting the region number, as shown in Table A1-1. These leading five or six digits denoting the time of data collection and the responsible

TABLE A1-1: Principal agencies engaged in serial oceanographic observation

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN HYDROGRAPHIC OFFICE</u>			
Headquarters	Tokyo	-0	All waters.
Region No. 1	Otaru	-1	Tsugaru & Soya, both up- & down-stream.
No. 2	Shiogama	-2	Tsugaru, mainly downstream and off San-riku coasts.
No. 3	Yokohama	-3	Pacific Ocean.
No. 4	Nagoya	-4	Pacific Ocean.
No. 5	Kobe	-5	Pacific Ocean.
No. 6	Hiroshima	-6	Seto Inland Sea.
No. 7	Kitakyushu	-7	Tsushima, upstream on East China Sea.
No. 8	Maizuru	-8	Tsushima, downstream on Sea of Japan.
No. 9	Niigata	-9	Tsushima downstream and Tsugaru upstream, on Sea of Japan.
No.10	Kagoshima	-10	Pacific Ocean & East China Sea.
No.11	Naha	-11	Pacific Ocean & East China Sea.
<u>JAPAN FISHERIES AGENCY</u>			
Headquarters	Tokyo		Administrative.
<u>Fisheries Research Laboratory</u>			
Hokkaido	Yoichi	FAH	Tsugaru & Soya, both up- & down-stream.
Tohoku	Shiogama	FAT	Tsugaru, downstream on Pacific Ocean.
Tokai	Tokyo	-	Pacific Ocean.
Nankai	Kochi	-	Pacific Ocean.
Seikai	Nagasaki	FAS	Tsushima, upstream on East China Sea.
Nihonkai	Niigata	FAN	Tsushima, downstream on Sea of Japan.
Naikai	Hiroshima	-	Seto Inland Sea.

(TO CONTINUE)

TABLE A1-1: Principal agencies engaged in serial oceanographic observation
(Cont'd)

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN METEOROLOGICAL AGENCY</u>			
Headquarters	Tokyo		All waters.
<u>Marine Meteorological Observatory</u>			
Hakodate	Hakodate		Tsugaru & Soya, downstream on Pacific Ocean and Sea of Okhotsk.
Kobe	Kobe		Mainly, Pacific Ocean.
Nagasaki	Nagasaki		Tsushima, upstream on East China Sea.
Maizuru	Maizuru		Tsushima, downstream on Sea of Japan.
<u>PREFECTURAL FISHERIES EXPERIMENT STATIONS</u>			
Hakodate	Hakodate	FKH	Tsugaru, up- & down-stream. Soya upstream.
Wakkanai	Wakkanai	FKW	Soya, channel and downstream.
Abashiri	Abashiri	FKA	Soya, downstream.
Kushiro	Kushiro	FKK	Tsugaru, far downstream.
Chuo (Hokkaido)	Yoichi	FKC	All waters around Hokkaido.
Aomori	Nishi-		
Nagasaki	Tsugaru	FXA	Tsugaru, up- and down-stream.
Saga	Nagasaki	FXN	Tsushima, far upstream on East China Sea.
Fukuoka	Karatsu	FXG	Tsushima, upstream on East China Sea.
Yamaguchi	Fukuoka	FXF	Tsushima, immediately upstream and channel.
	Nagato	FKY	Tsushima, channel and immediately down- stream on Sea of Japan.
Shimane	Hanada	FKS	Tsushima, far downstream.

(CONTINUED)

agency are parenthesized. Whenever a repeat survey was conducted in the same month by the same agency, another digit is then added outside the parentheses to designate the sequence of the repeat cruises.

For instance, the cruise number (7405-8)-3, as shown, will mean that this cruise took place in May 1974 by Region No. 8 (headquartered at Maizuru) as the third repeat survey for the month. The exact location of this cruise shall be determined by consulting the cruise charts for the year in this appendix. These cruise codes, which appear in the JHO data reports and the cruise track charts, were also employed in the OERS Cruise Data Inventory file.

Survey Types:

The cruise number alone does not reveal the types of survey which took place. The information on survey types, i.e. whether it was a serial observation, BT casts, XBT casts or GEK surveys, is shown in the cruise charts by appropriate symbols. For instance, in 1974, one recognizes the following symbols shown in the legend:

	Oceanographic stations
	XBT and BT stations
	BT and GEK stations
	GEK observations

It is cautioned that the symbols denoting cruise types were revised from time to time till the year 1973 when the convention shown above was standardized.

Data and Data Reports:

Having scanned the cruise track charts to establish a rough estimate on the extent of collected data, times of data collection and cruise types, one may turn to data archives to investigate the data. To aid in this purpose, Tables A1-2 through A1-4 have been

prepared showing, respectively, examples of serial, BT and GEK observations usually displayed in the JHO data reports. Table A1-5 explains format and standard notations being used in the data reports.

Table A1-6 summarizes the published JHO data reports since 1923. The JHO data reports have gone through several changes in title and publication schedule over the years. However, since around 1965, all the JHO oceanographic data have been published consistently in the annual issues titled:

"Data Report of Hydrographic Observations, Series of Oceanography."

In the United States, both the Scripps Institution of Oceanography at La Jolla, California, and the Woodshole Oceanographic Institution at Woodshole, Massachusetts, hold a complete set of the JHO data reports in their libraries.

Inquiries on detailed information on the JHO data may be directed to:

JAPAN OCEANOGRAPHIC DATA CENTER
Hydrographic Office (Suiro-bu)
Maritime Safety Agency (Kaijo Hoancho)
3-1 5-Chome, Tsukiji, Chuo-ku
Tokyo 104, Japan

Telephone Tokyo (03) 541-3811
Telex Tokyo (03) 252-2452
Telefax Tokyo (03) 545-2885

TABLE A1-2. Sample Data of JHO Serial Observations.

(7510-0)-2

Observed							Interpolated				Calculated		
Depth m	Temp. °C	S 0/00	O ₂ ml/L	PO ₄ -P μg-at./L	SiO ₂ -Si μg-at./L	pH	Depth m	Temp. °C	S 0/00	O ₂ ml/L	σ _t g/cm ³	Δσ 10 ⁻³ cm ³ /kg	ΔD Dyn. m
(7510-0)-2													
Area: Eastern China Sea & Southern Sea of Honsyu													
Date: Oct. 13-Nov. 16, 1975 Ship: Takuyo													
Ta. 1 (75087), 31-00. N, 130-00. E. OCT. 18, 1975, 06.0 GMT. DEPTH 0415. COLOR --.													
TRANS. --, WAVE 02/2A, WIND 02/23S, BAR. 13.1, AIR TEMP. DRY 23.4, WET 21.0, WEATHER X2, CLOUD T5, A8, VIS. 6													
0	26.50	33.835	4.67	0.00	10	8.29	0	26.50	33.835	4.67	22.02	581	0.000
10	26.75	33.802	4.70	0.00	8	8.29	10	26.75	33.802	4.70	21.92	591	0.059
19	26.73	33.810	4.66	0.00	7	8.30	20	26.74	33.816	4.66	21.93	590	0.118
28	26.79	33.870	4.61	0.00	7	8.29	30	26.77	33.861	4.62	21.96	587	0.177
48	26.57	33.861	4.67	0.04	8	8.29	50	26.46	33.912	4.64	22.09	574	0.293
72	24.90	34.580	4.24	0.13	8	8.22	75	24.78	34.655	4.24	23.17	471	0.424
96U	23.46	34.957	4.27	0.22	14	8.25	100	22.84	34.919	4.24	23.94	398	0.534
120U	19.59	34.646	4.04	0.54	19	8.21	125	19.03	34.644	4.01	24.76	319	0.625
144U	17.35	34.637	3.89	0.74	22	8.18	150	16.97	34.632	3.87	25.26	272	0.700
192U	15.00	34.588	3.80	0.91	27	8.14	200	14.78	34.579	3.80	25.72	229	0.827
240U	13.55	34.534	3.79	1.02	29	8.11	250	13.32	34.524	3.77	25.98	204	0.938
288U	12.71	34.488	3.61	1.26	30	8.08							
Ta. 2 (75088), 31-02. N, 129-30. E. OCT. 18, 1975, 11.0 GMT. DEPTH 0800. COLOR --.													
TRANS. --, WAVE 02/2A, WIND 02/11S, BAR. 14.6, AIR TEMP. DRY 22.6, WET 20.7, WEATHER X1, CLOUD T3, A6, VIS. 7													
0	26.90	34.038	4.72	0.00	7	8.33	0	26.90	34.038	4.72	22.05	579	0.000
10	27.19	34.030	4.63	0.11	5	8.33	10	27.19	34.030	4.63	21.95	588	0.058
19	27.18	34.030	4.61	0.00	4	8.33	20	27.18	34.030	4.62	21.95	588	0.117
29	27.21	34.033	4.62	0.11	4	8.34	30	27.20	34.035	4.62	21.95	588	0.176
49	27.03	34.073	4.58	0.04	4	8.34	50	26.92	34.078	4.57	22.07	576	0.293
73	23.89	34.291	4.24	0.24	7	8.29	75	23.73	34.331	4.25	23.23	465	0.424
97U	22.26	34.711	4.29	0.15	7	8.29	100	22.03	34.706	4.27	24.01	391	0.531
121U	20.18	34.669	4.09	0.46	10	8.26	125	19.73	34.663	4.07	24.60	335	0.623
145U	17.53	34.638	3.99	0.72	15	8.24	150	17.16	34.633	3.99	25.21	276	0.701
194U	14.84	34.576	3.88	1.07	22	8.20	200	14.56	34.559	3.84	25.75	226	0.829
243U	12.85	34.445	3.54	1.20	29	8.14	250	12.64	34.437	3.52	26.05	197	0.937
292U	11.68	34.411	3.41	1.43	37	8.11	300	11.59	34.408	3.40	26.23	180	1.035
380U	10.80	34.371	3.21	1.65	46	8.07	400	10.63	34.380	3.17	26.38	164	1.216
485U	9.03	34.378	2.79	2.04	64	8.00	500	8.67	34.377	2.70	26.70	135	1.375
583U	6.88	34.376	2.26	2.09	92	7.97	600	6.65	34.376	2.21	27.00	107	1.505
680U	6.13	34.382	2.17	2.54	106	7.91							
Ta. 3 (75089), 31-01. N, 128-59. E. OCT. 18, 1975, 15.0 GMT. DEPTH 0550. COLOR --.													
TRANS. --, WAVE 02/2A, WIND 02/15S, BAR. 13.7, AIR TEMP. DRY 23.1, WET 19.5, WEATHER X1, CLOUD T3, A2, VIS. 7													
0	26.90	34.041	4.69	0.07	2	8.29	0	26.90	34.041	4.69	22.05	578	0.000
10	27.09	34.011	4.70	0.09	4	8.30	10	27.09	34.011	4.70	21.97	586	0.058
20	27.08	34.059	4.67	0.09	4	8.29	20	27.08	34.059	4.67	22.01	582	0.117
30	27.11	34.012	4.68	0.11	4	8.28	30	27.11	34.012	4.68	21.96	587	0.175
49	26.99	34.042	4.63	0.02	4	8.28	50	26.84	34.055	4.62	22.08	575	0.292
74	22.65	34.412	4.14	0.54	8	8.23	75	22.54	34.421	4.13	23.63	426	0.418
98U	20.67	34.550	3.96	0.61	10	8.19	100	20.53	34.550	3.94	24.30	364	0.517
123U	19.06	34.554	3.82	0.80	15	8.16	125	18.93	34.568	3.85	24.73	323	0.604
148U	17.53	34.729	4.18	0.59	13	8.19	150	17.41	34.725	4.17	25.22	275	0.680
195U	15.12	34.627	4.01	0.93	18	8.14	200	14.95	34.617	3.99	25.71	229	0.809
241U	13.42	34.532	3.67	1.07	27	8.08	250	12.84	34.506	3.57	26.06	196	0.918
287U	10.50	34.408	3.16	1.63	43	7.99	300	10.13	34.394	3.09	26.48	154	1.009
380U	9.01	34.374	2.79	2.00	61	7.93	400	8.64	34.370	2.70	26.70	135	1.162
472U	7.15	34.368	2.34	2.34	84	7.85							
Ta. 4 (75090), 31-00. N, 128-31. E. OCT. 18, 1975, 18.0 GMT. DEPTH 0340. COLOR --.													
TRANS. --, WAVE 02/2A, WIND 02/15S, BAR. 11.1, AIR TEMP. DRY 23.1, WET 19.5, WEATHER X1, CLOUD T3, A5, VIS. 7													
0	26.30	33.827	4.70	0.07	5	8.28	0	26.30	33.827	4.70	22.08	576	0.000
10	26.48	33.818	4.72	0.11	4	8.28	10	26.48	33.818	4.72	22.01	582	0.058
20	26.50	33.818	4.75	0.11	4	8.27	20	26.50	33.818	4.75	22.01	582	0.116
29	26.50	33.835	4.69	0.11	4	8.28	30	26.49	33.846	4.69	22.03	580	0.174
49	26.31	34.121	4.62	0.00	3	8.27	50	26.23	34.133	4.61	22.33	551	0.288
74	23.58	34.348	4.27	0.28	7	8.22	75	23.47	34.353	4.26	23.33	456	0.414
99U	20.64	34.461	4.04	0.54	10	8.19	100	20.49	34.470	4.04	24.25	368	0.518
123U	17.49	34.637	3.90	0.76	16	8.15	125	17.36	34.636	3.90	25.17	281	0.600
148U	16.28	34.621	3.90	0.89	18	8.14	150	16.15	34.617	3.90	25.44	255	0.668
198U	13.09	34.508	3.67	1.17	27	8.09	200	13.01	34.505	3.66	26.03	199	0.784
248U	11.46	34.444	3.39	1.43	36	8.04	250	11.41	34.442	3.38	26.25	178	0.881
298U	10.57	34.408	3.20	1.70	46	7.99							
Ta. 5 (75091), 31-00. N, 128-01. E. OCT. 18, 1975, 21.0 GMT. DEPTH 0295. COLOR --.													
TRANS. --, WAVE 02/2A, WIND 36/15S, BAR. 13.8, AIR TEMP. DRY 23.1, WET 19.5, WEATHER X1, CLOUD T3, A3, VIS. 7													

TABLE A1-3. Sample Data of JHO BT Observations.

(7008-1), (7008-8), (7008-9), (7008-10)-1

No.	Date	Time	Position		Temperature °C												S.L. m	Air Temp. °C
			Lat.	Long.	Depth m													
					0	10	20	30	50	75	100	150	200	250				
Or70029	8-19	19-20	42-31N	139-36E	19.4	19.4	19.4	16.8	13.1	8.8	6.3	3.2	1.8	1.1	22	19.5		
Or70030		02-45	41-19	139-50	21.8	21.7	21.6	21.2	16.4	10.0	8.5	6.8	5.7	4.6	32	19.5		
Or70031		05-20	41-21	139-21	19.3	19.3	19.1	18.8	10.8	3.9	1.7	1.3	1.2	.....	31	20.5		
Or70032		08-30	41-22	138-40	18.3	18.3	14.3	7.9	3.1	2.5	2.0	1.4	1.3	1.2	14	20.5		
Or70033		11-35	41-22	138-02	19.3	19.2	9.0	2.8	1.6	1.2	1.0	0.9	0.9	0.8	12	21.5		
Or70034	8-20	16-55	42-06	138-36	17.4	17.3	14.1	8.9	2.5	1.4	1.0	0.8	0.8	(0.8)	11	18.5		
Or70035		19-55	42-30	138-13	17.6	17.6	16.8	14.0	6.3	2.9	2.3	1.2	1.0	0.7	11	18.5		
Or70036		22-35	42-31	138-40	16.3	15.6	8.8	3.0	1.9	1.3	1.2	1.0	0.9	0.7	9	18.5		
Or70037		01-25	42-31	138-10	18.4	18.3	16.5	6.9	3.1	1.9	1.4	1.1	0.8	0.7	17	18.0		
Or70038		07-20	43-13	138-48	17.8	17.5	14.6	11.4	7.8	5.4	4.2	2.7	2.1	1.7	12	20.5		
Or70039		11-05	43-31	138-19	18.0	15.9	14.6	13.5	5.9	3.6	2.6	1.7	1.2	0.9	0	20.5		
Or70040		14-10	43-31	140-00	19.6	19.2	13.5	17.4	10.6	8.8	7.1	4.3	2.7	(1.5)	0	23.0		
(7008-8)																		
Area: Southern Japan Sea																		
Date: Aug. 23rd-Aug. 27th, 1970 Ship: Oki																		
Ma70051	8-23	09-20	35-50N	135-20E	23.9	23.9	23.9	23.6	20.5	19.2	16.9	.....	.....	.....	30	30.0		
Ma70052		12-25	36-17	135-04	24.9	24.3	23.8	21.0	17.4	16.3	15.2	11.0	5.0	2.6	20	29.0		
Ma70053		15-20	36-44	134-47	25.1	24.0	23.4	23.2	16.1	14.1	10.0	6.0	3.7	.....	36	28.5		
Ma70054		18-25	37-11	134-30	24.0	23.6	23.4	22.9	22.6	15.1	11.3	7.7	5.0	4.4	55	27.0		
Ma70055		21-23	37-38	134-14	23.3	22.9	22.0	21.9	18.7	15.3	13.0	8.6	4.5	2.8	32	26.0		
Ma70056		8-24	00-40	38-05	133-57	24.7	24.6	21.5	16.8	14.9	13.5	9.8	5.6	4.1	3.2	10	26.0	
Ma70057			03-45	37-41	133-35	23.5	22.3	20.7	19.7	17.5	10.3	8.5	5.7	3.7	2.6	56	25.0	
Ma70058	06-35		37-13	133-10	24.6	24.4	23.6	22.8	18.9	16.4	14.4	8.0	2.9	2.0	18	25.0		
Ma70059	8-25	10-10	36-50	133-33	23.8	22.3	21.7	21.4	15.7	10.6	9.3	5.6	2.8	2.4	40	25.0		
Ma70060		13-25	36-24	133-50	25.0	23.9	23.4	21.5	16.4	15.6	14.3	5.9	2.5	1.9	28	26.5		
Ma70061	8-26	16-15	35-56	134-08	25.8	23.1	22.5	20.7	17.5	16.6	15.7	11.9	4.0	2.4	24	32.5		
Ma70062		19-40	35-56	133-35	24.4	22.4	21.2	20.0	17.4	16.3	14.2	7.2	.....	.....	.....	26.0		
Ma70063		11-45	36-22	132-30	27.6	25.2	22.0	19.2	16.3	14.9	13.2	4.3	2.4	2.0	.....	28.5		
Ma70064		14-10	36-30	131-58	27.6	25.3	22.5	16.1	13.6	9.5	5.9	1.8	1.6	1.8	.....	24.3		
Ma70065		17-20	36-00	132-00	26.6	24.2	20.5	15.2	11.6	7.7	3.9	1.7	1.6	1.7	17	34.0		
Ma70066		20-30	35-30	132-00	27.2	26.8	21.8	18.4	16.5	15.6	15.0	11.1	.....	.....	14	28.0		
Ma70067		8-27	01-25	35-45	133-00	26.0	24.5	23.4	23.2	20.4	18.6						26.5	
(7008-9)																		
Area: Middle Japan Sea																		
Date: Aug. 26th-Aug. 31st, 1970 Ship: Kiso																		
Ni70022	8-26	13-20	37-47N	138-35E	27.3	26.4	25.2	24.5	22.7	19.1	16.4	9.9	5.0	2.9	12	28.1		
Ni70023		16-35	37-35	138-00	26.6	25.0	23.4	21.9	18.5	15.7	13.8	8.6	5.6	3.3	6	27.5		
Ni70024		19-20	37-52	137-36	26.4	25.7	25.5	25.0	20.4	17.3	16.1	8.5	3.6	2.5	3	26.5		
Ni70025		21-55	38-10	137-12	25.1	24.6	24.3	23.7	19.4	15.6	11.0	5.3	2.9	1.8	6	26.0		
Ni70026		8-27	00-10	38-26	136-48	25.4	23.5	22.5	21.8	13.2	9.9	7.4	3.9	2.5	1.8	4	25.0	
Ni70027			02-55	38-43	136-24	24.5	23.8	19.5	14.5	12.6	10.4	9.6	6.9	4.6	3.1	13	24.5	
Ni70028			05-40	39-00	136-00	24.4	23.3	20.0	15.0	11.3	9.8	8.3	5.7	3.9	2.3	7	23.5	
Ni70029	08-25		38-45	135-40	24.0	23.5	22.2	20.4	14.2	11.6	10.0	7.6	4.6	3.1	11	24.2		
Ni70030	8-28	10-55	38-30	135-20	25.0	22.8	22.2	21.0	11.8	6.7	4.9	2.8	2.2	1.6	3	25.2		
Ni70031		13-20	38-11	135-38	25.2	22.4	21.7	20.9	15.5	12.7	10.2	5.6	3.3	2.2	3	26.2		

TABLE A1-4. Sample Data of JHO GEK Observations.

(7301-0)										(7301-0), (7301-1), (7301-3), (7301-4) (7301-5)-1, (7301-5)-2, (7301-5)-3									
No.	Date	Time	Position		Current		Sur- face Temp. °C	Wind		No.	Date	Time	Position		Current		Sur- face Temp. °C	Wind	
			Lat.	Long.	Dir.	Vel. kn		Dir./Vel.	Lat.				Long.	Dir.	Vel. kn	Dir./Vel.			
(7301-0) Area: Southern Sea of Honsyū Date: Jan. 11 - Jan. 21, 1973 Ship: Takuyō																			
Ta73001	1-11	16-15	34-45N	139-38E	58 0.1	16.2	NNE/ 6			Ta73091		06-52	33-23	140-16	318 1.0	19.9	NE/ 8		
Ta73002		17-40	34-31	139-43	192 0.5	16.8	ENE/ 5			Ta73092		08-00	33-22	140-26	189 1.0	19.6	NE/12		
Ta73003		19-00	34-17	139-49	121 0.4	16.2	NE/ 7			Ta73093		09-30	33-35	140-22	140 1.1	19.6	NE/11		
Ta73004		20-30	34-03	139-58	114 1.1	16.0	N/ 9			Ta73094		11-10	33-47	140-14	136 0.8	19.3	NE/11		
Ta73005		21-50	33-51	140-01	310 0.9	15.5	WNW/ 8			Ta73095		12-35	33-58	140-09	93 1.8	19.3	NE/13		
Ta73006		23-30	33-34	140-00	122 0.5	16.0	WNW/ 7			Ta73096		14-30	34-10	140-03	101 1.4	16.4	NE/13		
Ta73007	1-12	00-50	33-19	140-05	144 0.6	17.9	NW/11			Ta73097		16-00	34-21	139-53	95 0.6	15.4	NE/12		
Ta73008		02-20	33-04	140-06	191 0.7	18.7	WNW/11			Ta73098		17-00	34-30	139-47	240 0.2	15.4	NE/ 9		
Ta73009		09-40	32-49	140-05	92 1.3	20.6	N/10			Ta73099		18-15	34-40	139-40	231 0.6	16.1	NE/ 6		
Ta73010		10-50	32-39	140-10	79 0.6	20.3	N/ 9												
Ta73011		12-10	32-25	140-16	40 0.8	20.3	N/ 8			(7301-1) Area: The Straits of Sōya Date: Jan. 24, 1973 Ship: Sarobetu									
Ta73012		13-35	32-14	140-17	225 0.1	19.9	N/15			Ot73001	1-24	11-09	45-25N	141-31E	0 0.2	4.0	N/ 2		
Ta73013		14-40	32-03	140-18	71 0.3	19.5	NNW/13			Ot73002		12-19	45-25	141-22	315 0.1	5.0	N/ 2		
Ta73014		15-55	31-50	140-17	90 0.9	19.7	NNW/14			Ot73003		12-57	45-26	141-13	65 0.1	5.0	N/ 3		
Ta73015		20-50	32-13	139-59	106 0.8	20.5	N/10			Ot73004		13-38	45-30	141-11	45 0.1	6.0	N/ 5		
Ta73016		22-00	32-19	139-40	88 0.8	19.7	NNE/10			Ot73005		14-25	45-36	141-09	0 0.1	7.0	N/ 5		
Ta73017		23-40	32-24	139-25	110 0.5	20.1	-			Ot73006		15-07	45-37	141-15	0 0.3	5.0	N/ 5		
Ta73018	1-13	01-30	32-30	139-08	110 0.8	20.2	N/ 4			Ot73007		15-49	45-36	141-23	45 0.1	6.0	NE/12		
Ta73019		02-30	32-36	138-59	109 1.2	20.1	N/ 4												
Ta73020		03-45	32-45	138-53	93 1.8	20.5	NNE/ 5												
Ta73021		05-10	32-56	138-45	100 2.6	19.5	N/ 4			(7301-3) Area: Off Iro Saki Date: Jan. 17, 1973 Ship: Sumida									
Ta73022		07-00	33-06	138-37	93 3.2	18.8	NW/ 3			Yo73001	1-17	10-20	34-31N	138-51E	252 0.3	17.0	E/ 4		
Ta73023		08-55	33-17	138-25	85 0.9	16.6	NW/10			Yo73002		11-15	34-21	138-51	311 1.2	17.5	NNE/ 6		
Ta73024		10-15	33-26	138-15	235 0.3	16.4	NW/ 1			Yo73003		12-15	34-11	138-51	292 0.5	17.5	NNE/ 7		
Ta73025		11-50	33-36	138-05	209 0.2	16.3	NW/13												
Ta73026		13-30	33-47	137-57	227 0.7	14.9	NW/12												
Ta73027		15-35	34-00	137-42	201 0.7	15.7	WNW/15												
Ta73028		16-45	34-00	137-31	180 0.5	15.9	NW/18												
Ta73029		18-20	34-01	137-13	81 0.4	16.1	NNW/18												
Ta73030		20-15	34-00	136-57	86 0.7	16.3	NW/17												
Ta73031		21-55	33-45	136-48	210 1.1	16.4	NW/ 9			(7301-4) Area: Off Kumano Nada Date: Jan. 13, 1973 Ship: Kamisima									
Ta73032		22-50	33-32	136-43	214 0.8	16.3	N/12			Na73001	1-13	08-00	33-53N	136-16E	108 0.3	16.5	NNW/ 2		
Ta73033	1-14	00-10	33-18	136-37	256 0.4	16.3	N/ 9			Na73002		09-15	33-38	136-16	339 0.5	16.5	N/ 4		
Ta73034		01-05	33-10	136-35	110 1.8	18.4	N/ 7			Na73003		10-30	33-23	136-16	86 1.5	18.0	NW/ 4		
Ta73035		02-25	32-56	136-34	118 2.2	20.3	NW/ 3			Na73004		11-40	33-08	136-16	104 2.5	20.0	NW/ 4		
Ta73036		03-35	32-44	136-31	133 0.8	20.1	NW/ 3			Na73005		12-35	32-58	136-16	116 1.6	20.0	NW/ 4		
Ta73037		04-45	32-32	136-30	110 1.0	19.5	NW/ 3												
Ta73038		05-55	32-20	136-26	110 1.2	19.3	NW/ 2												
Ta73039		07-45	32-29	136-11	108 0.9	19.3	N/ 7												
Ta73040		09-25	32-37	135-54	154 0.7	19.4	N/ 6												
Ta73041		10-50	32-45	135-43	113 0.8	19.7	N/ 7			(7301-5)-1 Area: Off Sikoku Date: Jan. 8 - Jan. 9, 1973 Ship: Muroto									
Ta73042		12-45	32-55	135-24	100 1.2	19.4	N/ 8			Ko73001	1-8	10-43	33-06N	133-25E	160 0.3	16.8	NW/ 7		
Ta73043		13-40	33-02	135-21	65 0.2	20.2	NNE/ 7			Ko73002		12-20	32-52	133-14	172 0.1	18.0	WNW/ 8		
Ta73044		14-55	33-14	135-17	93 1.5	20.7	NNE/ 9			Ko73003		13-40	32-56	133-25	92 0.5	18.0	NNW/ 8		
Ta73045		15-55	33-25	135-16	90 2.1	20.5	NNE/ 7			Ko73004		15-35	33-04	133-46	167 0.9	16.5	NW/11		
Ta73046	1-15	19-30	33-31	134-50	63 0.9	19.6	N/16			Ko73005		16-33	33-09	133-57	353 0.6	17.4	NW/14		
Ta73047	1-18	14-50	33-07	133-37	204 0.4	18.3	W/11			Ko73006		17-48	33-14	133-46	223 1.0	17.6	NNW/12		
Ta73048		15-50	32-57	133-42	170 1.2	17.5	W/13			Ko73007		18-47	33-20	133-35	226 0.4	16.0	NNW/10		
Ta73049		17-00	32-45	133-43	86 2.6	20.7	W/12			Ko73008	1-9	10-30	33-10	133-35	151 0.5	15.4	WNW/ 4		
Ta73050		18-05	32-34	133-49	83 2.0	21.2	NW/13			Ko73009		11-25	33-00	133-35	100 0.6	15.4	WNW/ 5		
Ta73051		19-25	32-22	133-54	84 1.4	21.3	NW/13			Ko73010		12-25	32-50	133-35	104 0.4	18.2	WNW/ 7		
Ta73052		20-35	32-12	133-58	41 0.6	21.1	NW/15			Ko73011		13-25	32-40	133-35	57 3.4	18.2	WNW/ 7		
Ta73053		21-50	32-20	134-09	95 0.7	21.3	WNW/14			Ko73012		14-35	32-30	133-35	56 2.5	20.0	WNW/ 4		
Ta73054		22-50	32-28	134-20	99 1.1	21.3	NW/14			Ko73013		15-43	32-20	133-35	59 1.5	19.2	W/ 5		
Ta73055	1-19	00-05	32-38	134-26	75 1.2	24.3	NW/15			Ko73014		16-48	32-10	133-35	106 0.7	19.0	W/ 5		
Ta73056		01-15	32-49	134-36	58 1.1	24.3	NW/15			Ko73015		17-53	32-00	133-35	162 0.6	18.3	W/ 4		
Ta73057		02-25	33-00	134-39	35 1.6	24.2	NW/13			Ko73016		18-55	31-50	133-35	168 0.5	17.0	NW/ 4		
Ta73058		03-40	33-09	134-50	62 1.3	20.9	NW/13												
Ta73059		04-50	33-20	134-56	97 2.3	20.2	NNW/21												
Ta73060		06-03	33-30	135-03	32 0.8	18.5	NNW/19												

TABLE A1-5. Format and Notations of JHO Data Display.

Serial Oceanographic Observations

A. Explanations of the heading of each station (surface environmental information).

	Ta. 1	(76001)
1.	Station number for each cruise,	Consecutive station numbers of the Hydrographic Department for 1976
2.	Date and Time are shown in GMT.	
3.	Depth gives the depth to bottom (sounding) in meters.	
4.	Color gives the water color in Fore-Ule scale.	
5.	Transparency gives the values obtained in meters by using the Secchi disc.	
6.	Wave direction is expressed in a scale of 36 points according to the NODC code. The affixed letters A, H, P give the amount, height and period according to WMO codes 3700, 1555 and 3155, respectively.	
7.	Wind direction is given in scale of 36 points according to the NODC code and the wind speed (in knots) and wind force (in Beaufort scale) are distinguished with the affixed letters of S or F.	
8.	Barometric pressure is given in millibars.	
9.	Weather is given according to WMO code 4501 (the affix X is entered).	
10.	Cloud type and amount are given according to WMO code 0500 (the affix T is entered) and WMO code 2700 (the affix A is entered).	
11.	Visibility is given according to WMO code 4300.	
12.	Salinity is measured by using of an inductive coupled salinometer made in Australia.	
13.	Dissolved oxygen analyses were made on board by the Winkler method.	
14.	Inorganic phosphate analyses were made by the molybdenum blue method.	
15.	Silicate analyses were made by the silico-molybdate method.	
16.	Sodium silicate solution was used as the standard solution.	
17.	pH was determined by the use of a glass electrode pH meter.	
18.	The chemical analyses of phosphate, silicate and pH were made immediately after sampling, using a self-recording colorimeter.	

B. Notations and units

σ_t : Density $\sigma_t = (\rho_{st} - 1)10^3$ in g/cm^3

$\Delta\sigma_t$: Thermosteric anomaly $\Delta\sigma_t = 0.02736 - \frac{\sigma_t \cdot 10^{-3}}{1 + \sigma_t \cdot 10^{-3}}$ in $10^{-5} cm^3/g$

ΔD : Anomaly of dynamic depth in dynamic meter.

S: Salinity, $^{\circ}/_{\infty}$

O₂: Dissolved oxygen, ml/L

P: Dissolved inorganic phosphate-phosphorus, $\mu g-at./L$

Si: Reactive silicate silicon, $\mu g-at./L$

- C. Explanations of the symbols used in listed Oceanographic Data Tables.** The symbol "U" in the depth column shows the depth determined thermometrically. The "Q" in the column of each element means the value is doubtful and it should not be used for interpolation. The "N" in the observed data shows the value was neglected in the interpolation due to machine processing.

STD Observations

The value in a parentheses () is an interpolated value.

Bathythermograph Observations and Expendable Bathythermograph Observations

Date and Time are shown in GMT.

S.L. Surface Layer Depth in meters

Current Observations by GEK

Date and Time are shown in GMT

TABLE Al-6. Chronology of JHO data reports
on serial observations

DATA YEAR	DATA REPORT	REPORT YEAR
<u>PRE-WAR PERIOD:</u>		
1923 - 1929	Oceanographic Bulletin	No. 3 1948
1930 - 1931	" "	6 1949
1931 - 1935	Hydrographic Bull., Special	No. 6 1950
1935 - 1938	" " "	8 1951
1938 - 1941	" " "	9 1952
1938 - 1940	" " "	13 1954
1939 - 1941	" " "	16 1955
1931 - 1941	Hydrographic Bulletin	No.69 1962
1941	" "	71 1962
1942	" "	74 1963
1943	Data Report of Hydrographic Observations, Series of Oceanography	No. 2 1966
1944	" "	6 1968
<u>POST-WAR PERIOD:</u>		
1946	Oceanographic Bulletin	No. 1 1947
1946	" "	4 1949
1946 - 1948	Hydrographic Bull., Special	No.10 1953
1947	Oceanographic Bulletin	No. 5 1949
1948	Hydrographic Bull., Special	No. 5 1950
1949	Hydrographic Bulletin	No.14 1949
1949	" "	15 1949
1949	" "	16 1950
1949	Hydrographic Bull., Special	No. 7 1950
1950	" "	14 1954
1951	" "	15 1954
1952 - 1953	Hydrographic Bulletin	No.51 1956
1954 - 1955	" "	58 1959
1956	" "	62 1959
1957	" "	64 1960
1958	" "	66 1961
1959	" "	68 1961
1960	" "	75 1964
1961	" "	77 1964

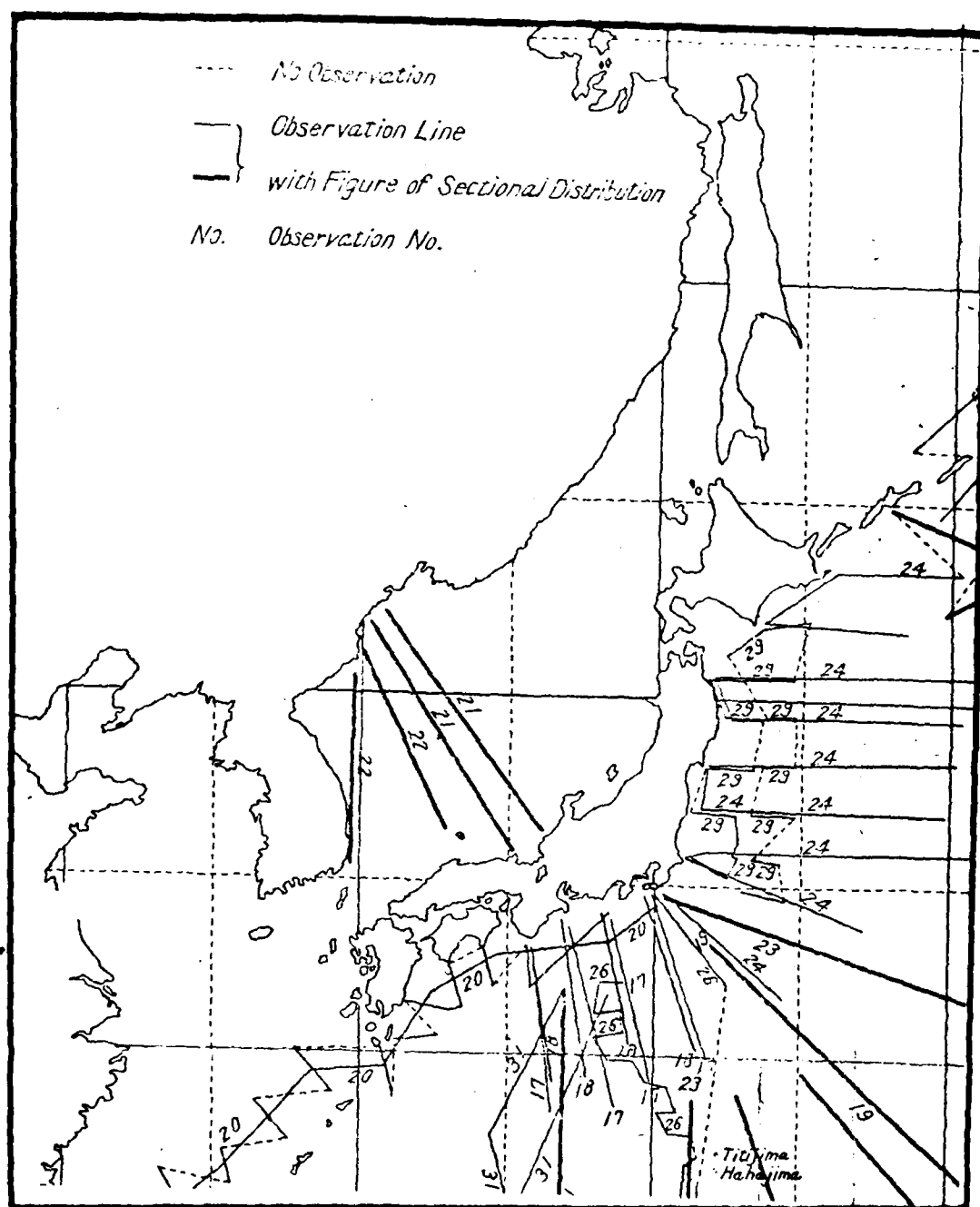
(To Continue)

TABLE A1-6. (Cont'd)

DATA YEAR	DATA REPORT	REPORT YEAR
1962	Data Report of Hydrographic Observations, Series of Oceanography	No. 1 1965
1963	" "	3 1966
1964	" "	4 1967
1965	" "	5 1967
1966	" "	7 1968
1967	" "	8 1970
1968	" "	9 1970
1969	" "	10 1973
1970	" "	11 1974
1971	" "	" "
1972	" "	12 1975
1973	" "	13 1976
1974	" "	14 1977
1975	" "	15 1978
1976	" "	16 1979

OCEANOGRAPHIC CRUISE CHARTS
1932 - 1976

JAPAN HYDROGRAPHIC OFFICE

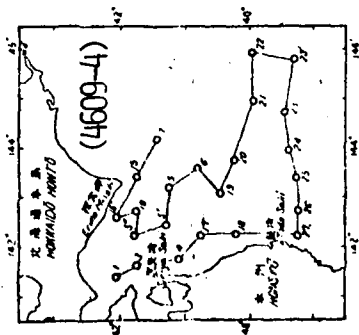


CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1932, 33, & 34

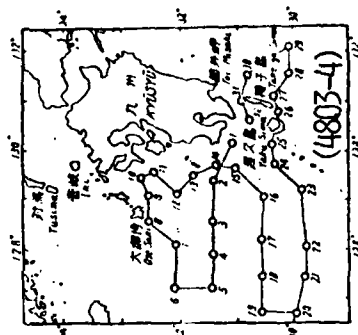
PRE-WORLD WAR II DATA

OBS. NO.	DATES	OBS. NO.	DATES
20	JAN-APR 1933	25	DEC 1933
21	JUN-JUL 1932	26	JAN-FEB 1934
22	JUL-AUG 1933	27	APR-SEP 1933
23	MAY-JUN 1933	28	APR-AUG 1934
24	JUL-OCT 1933	29	MAR-APR 1934

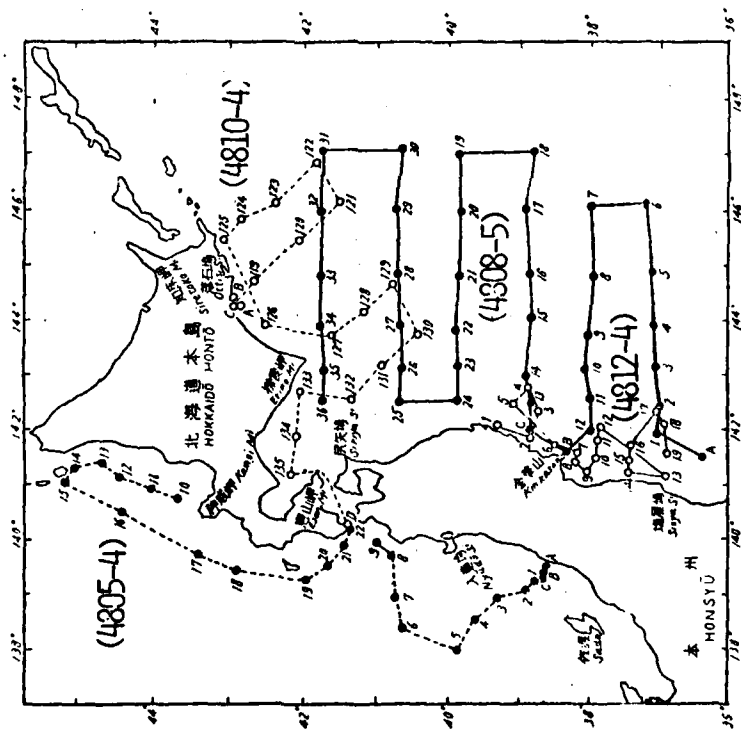
第 3 圖

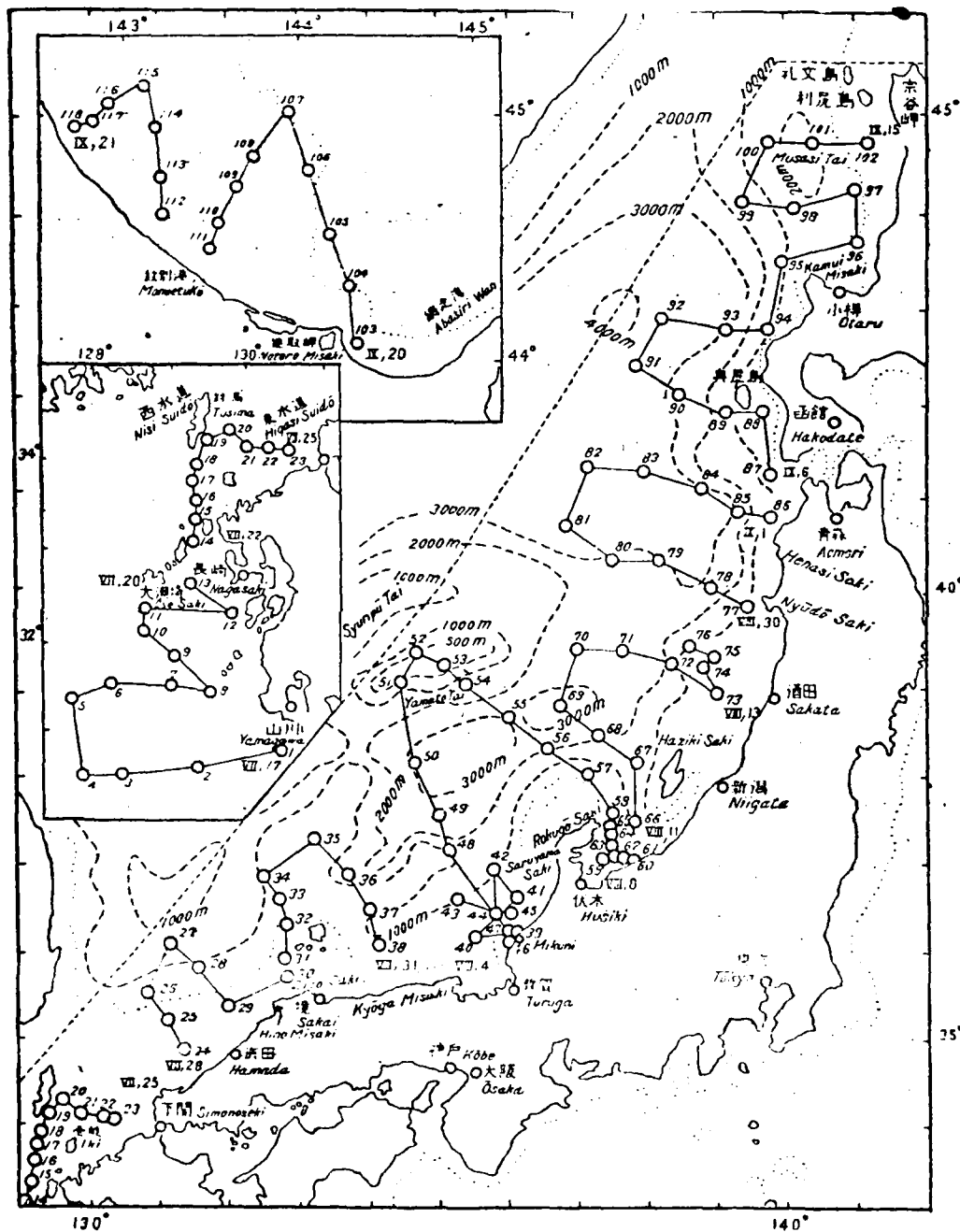


第 4 圖

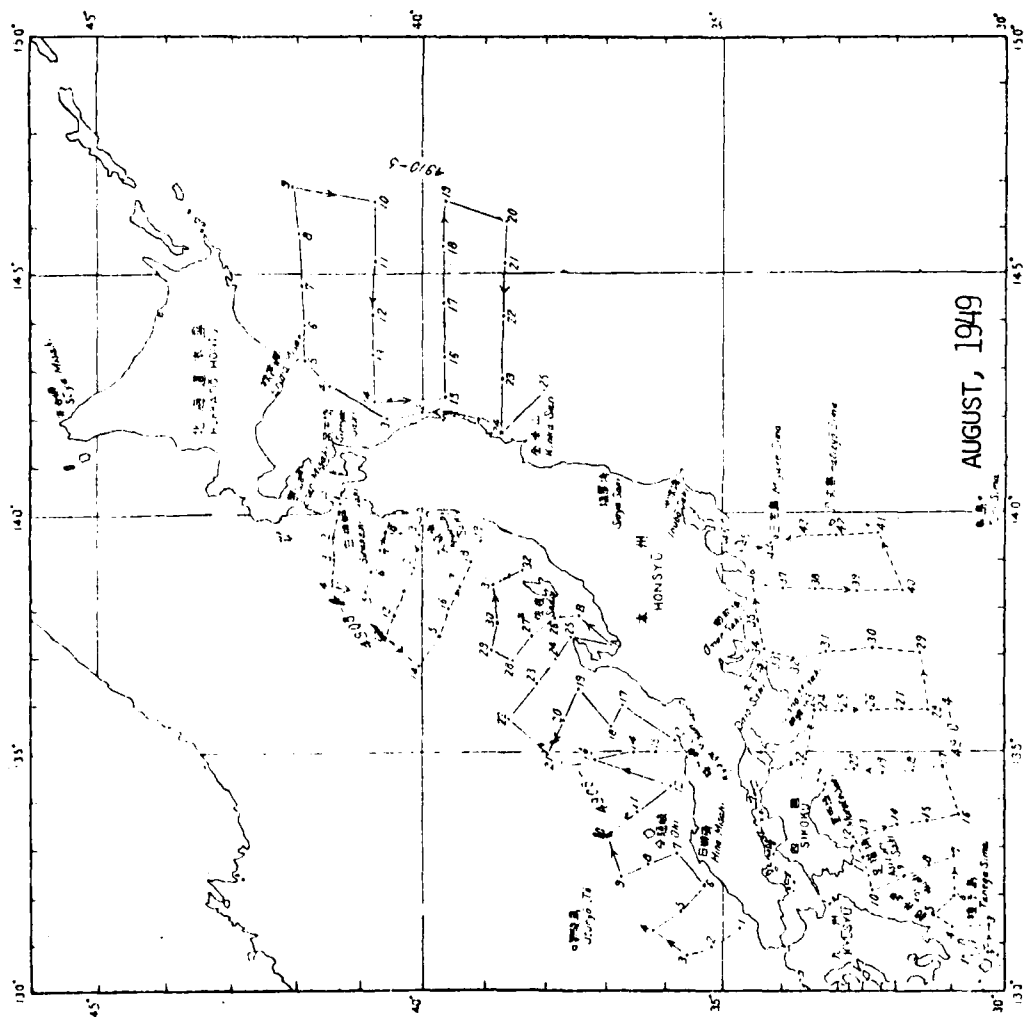


第 6 圖

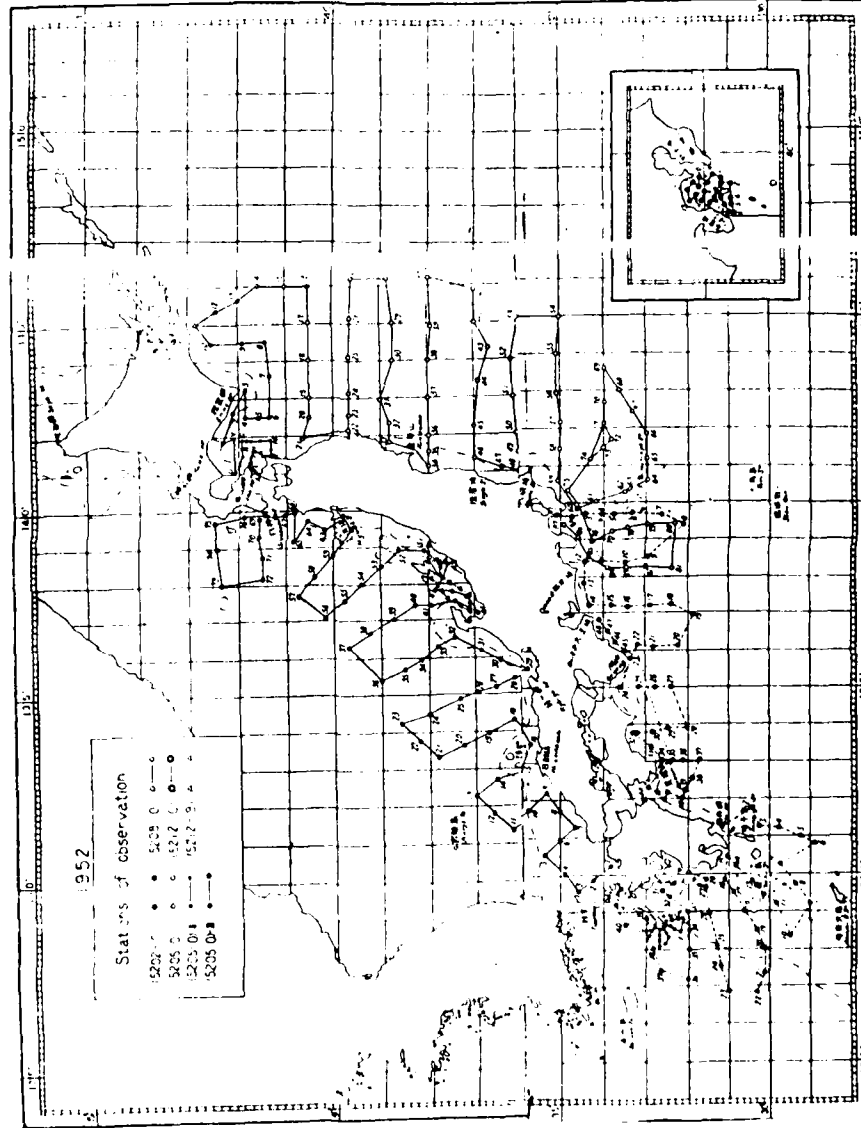




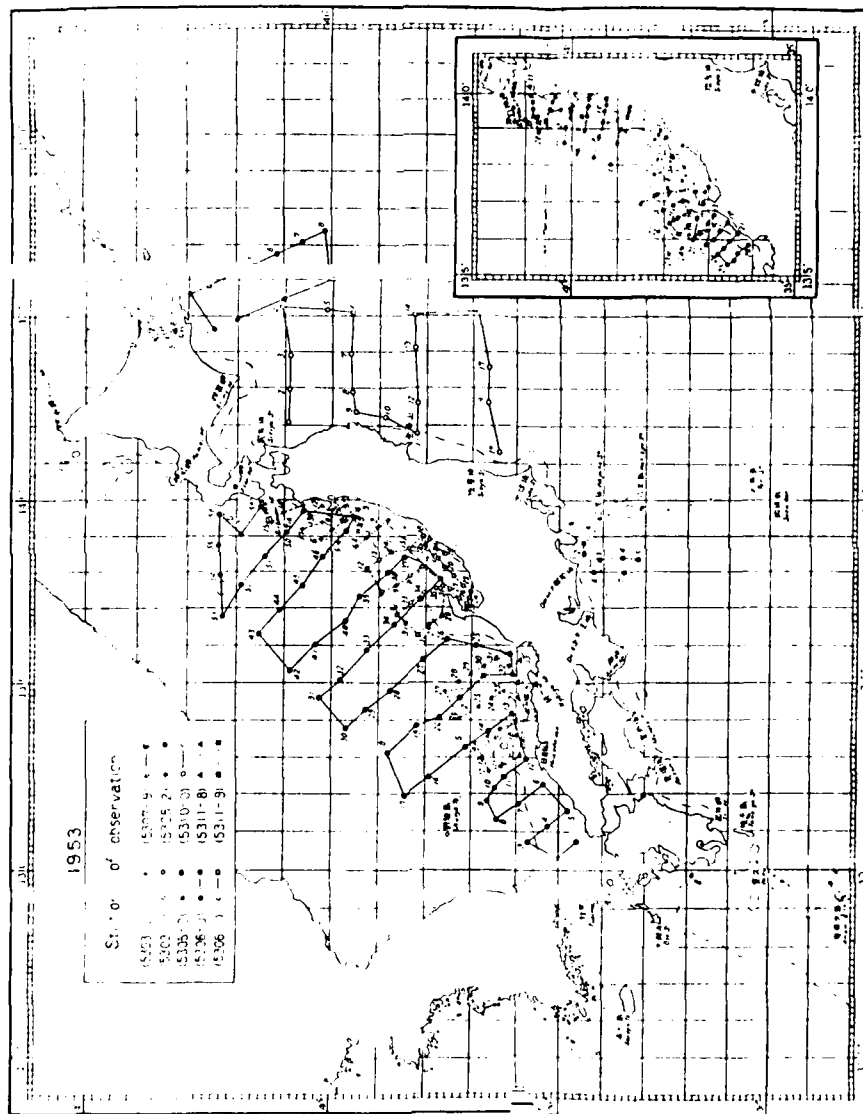
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1948



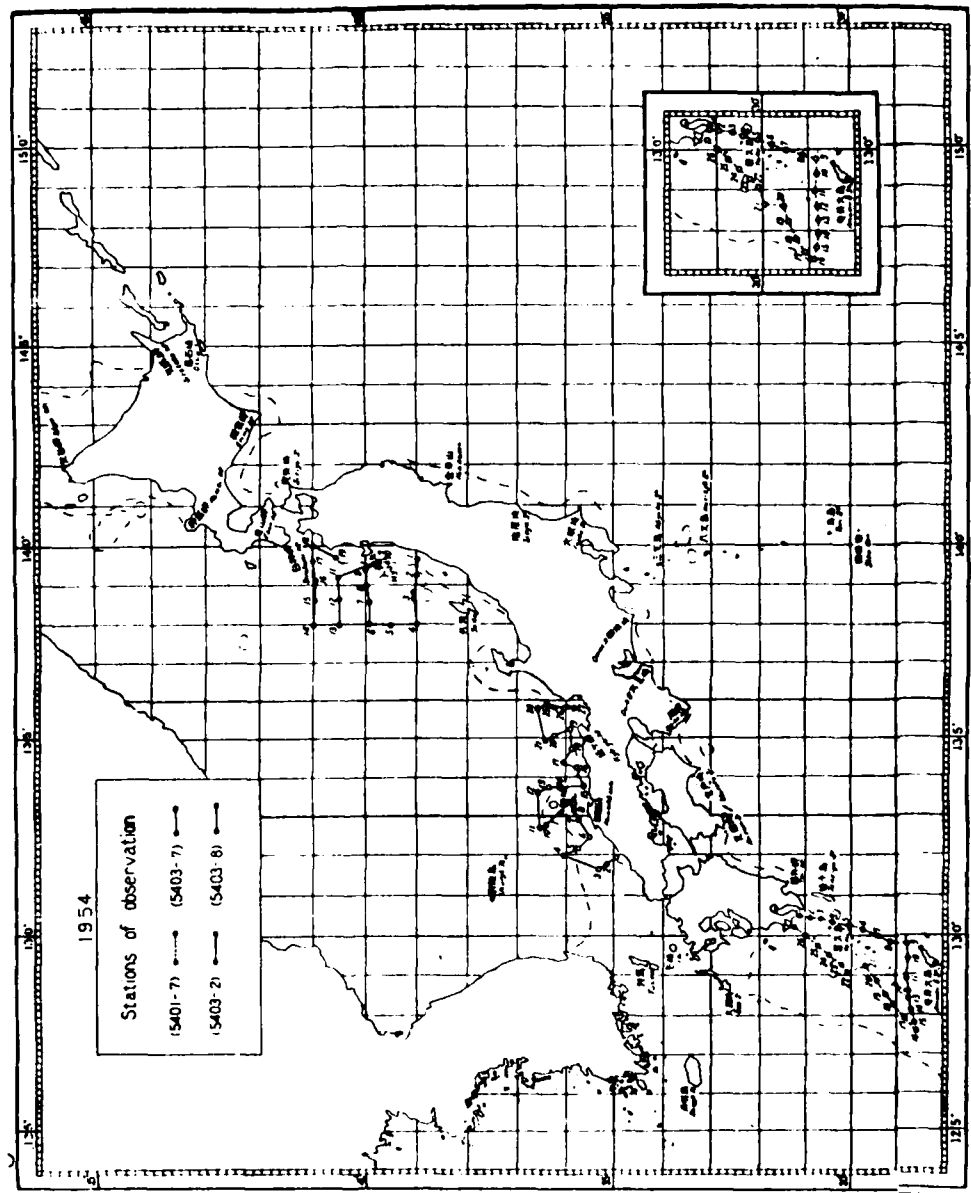
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1949



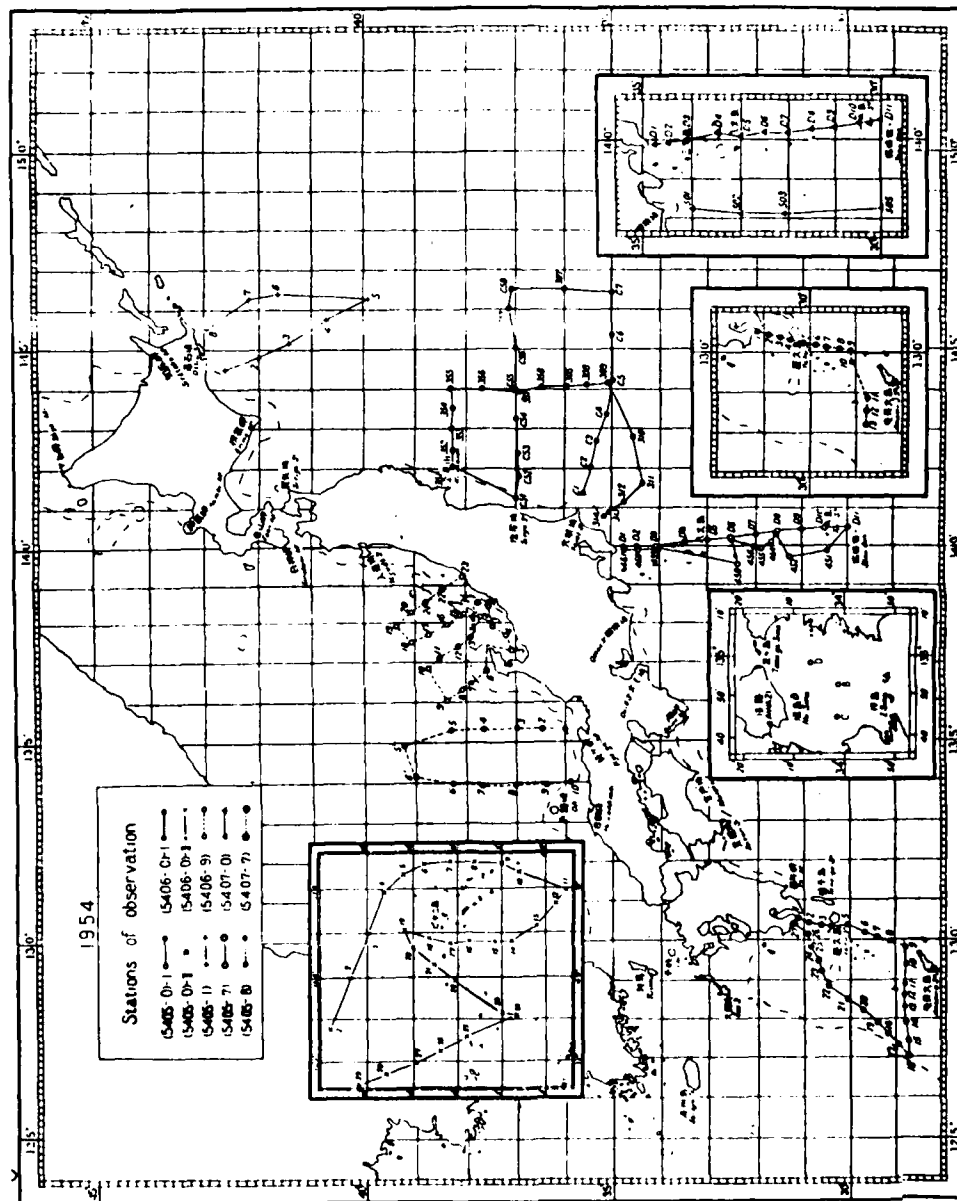
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1952



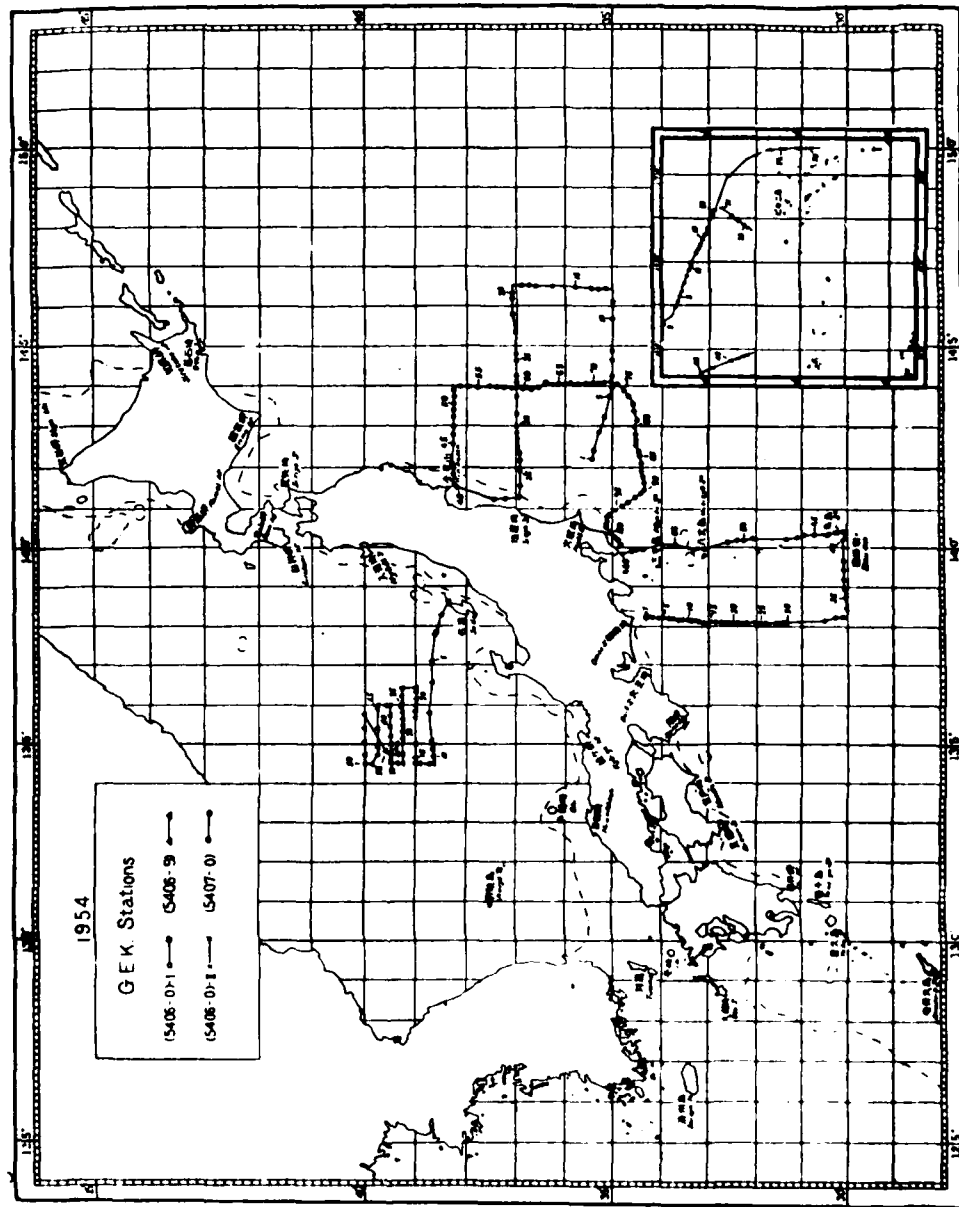
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1953



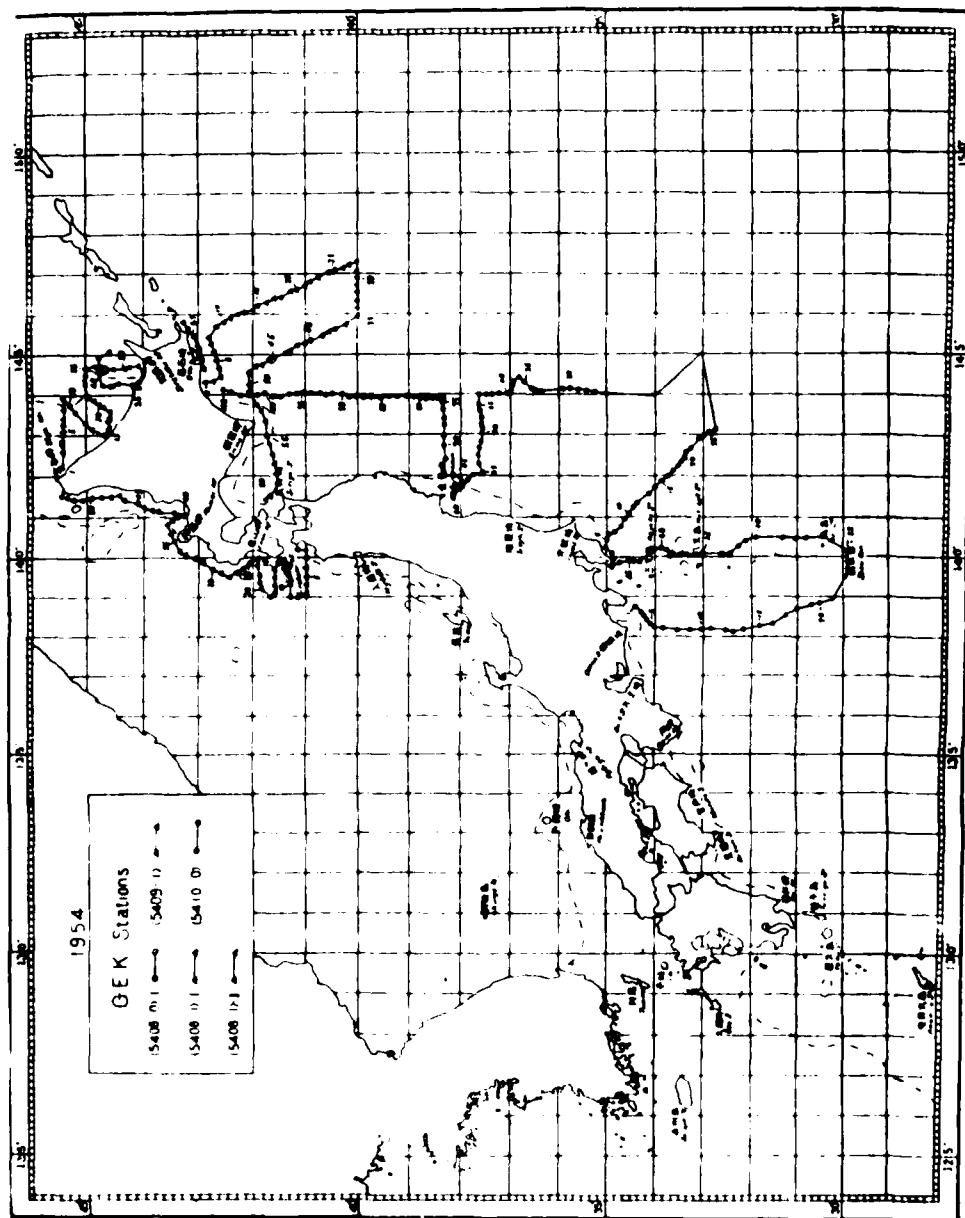
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1954



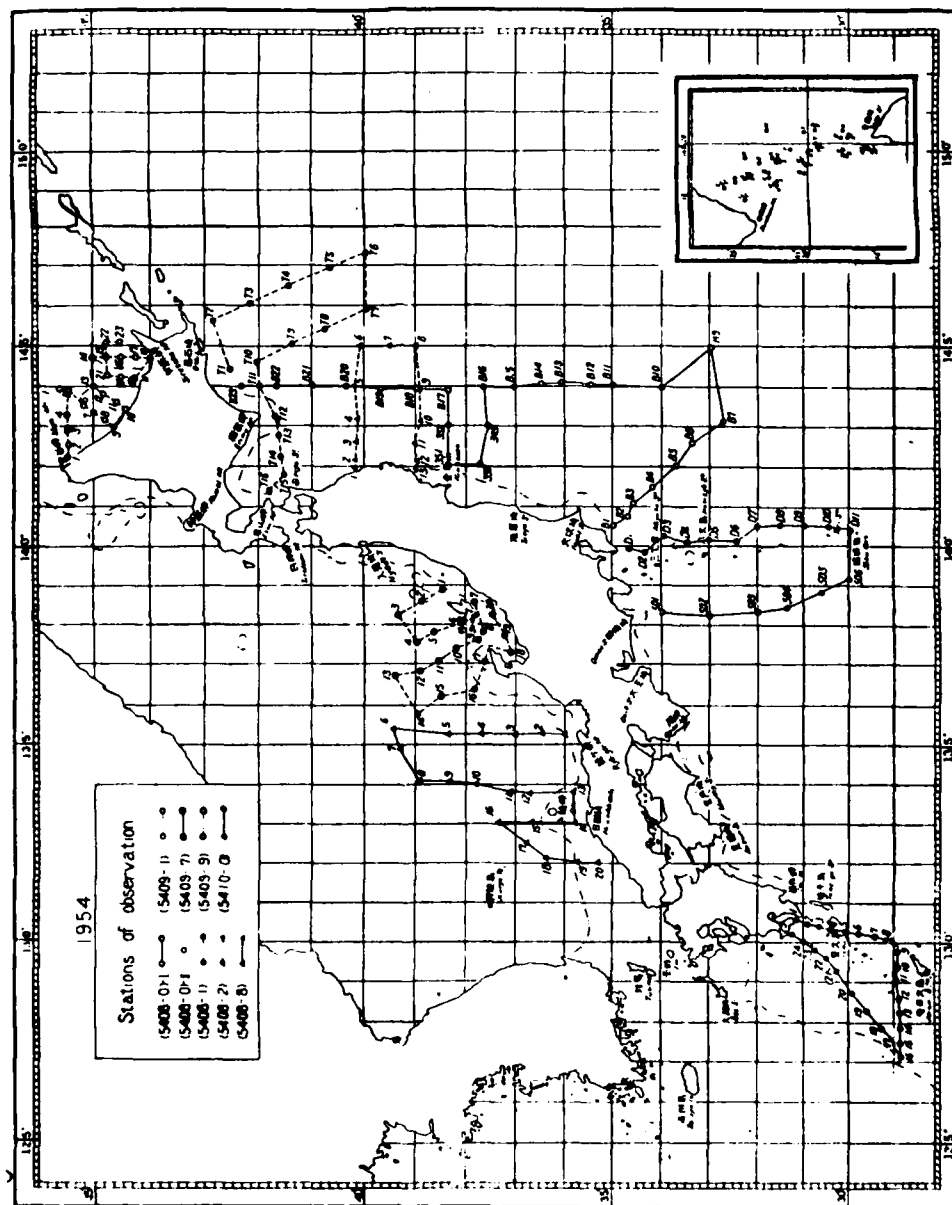
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1954



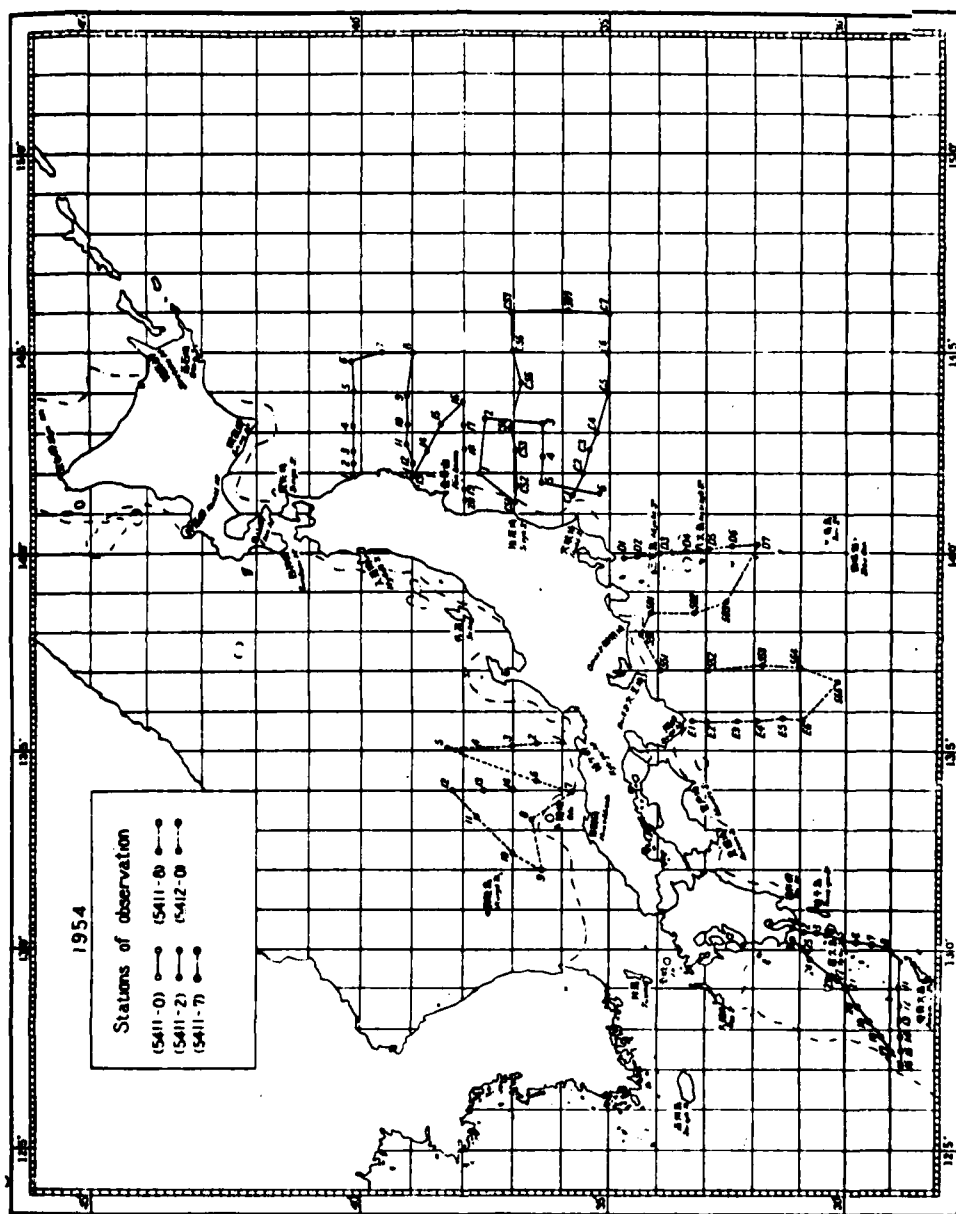
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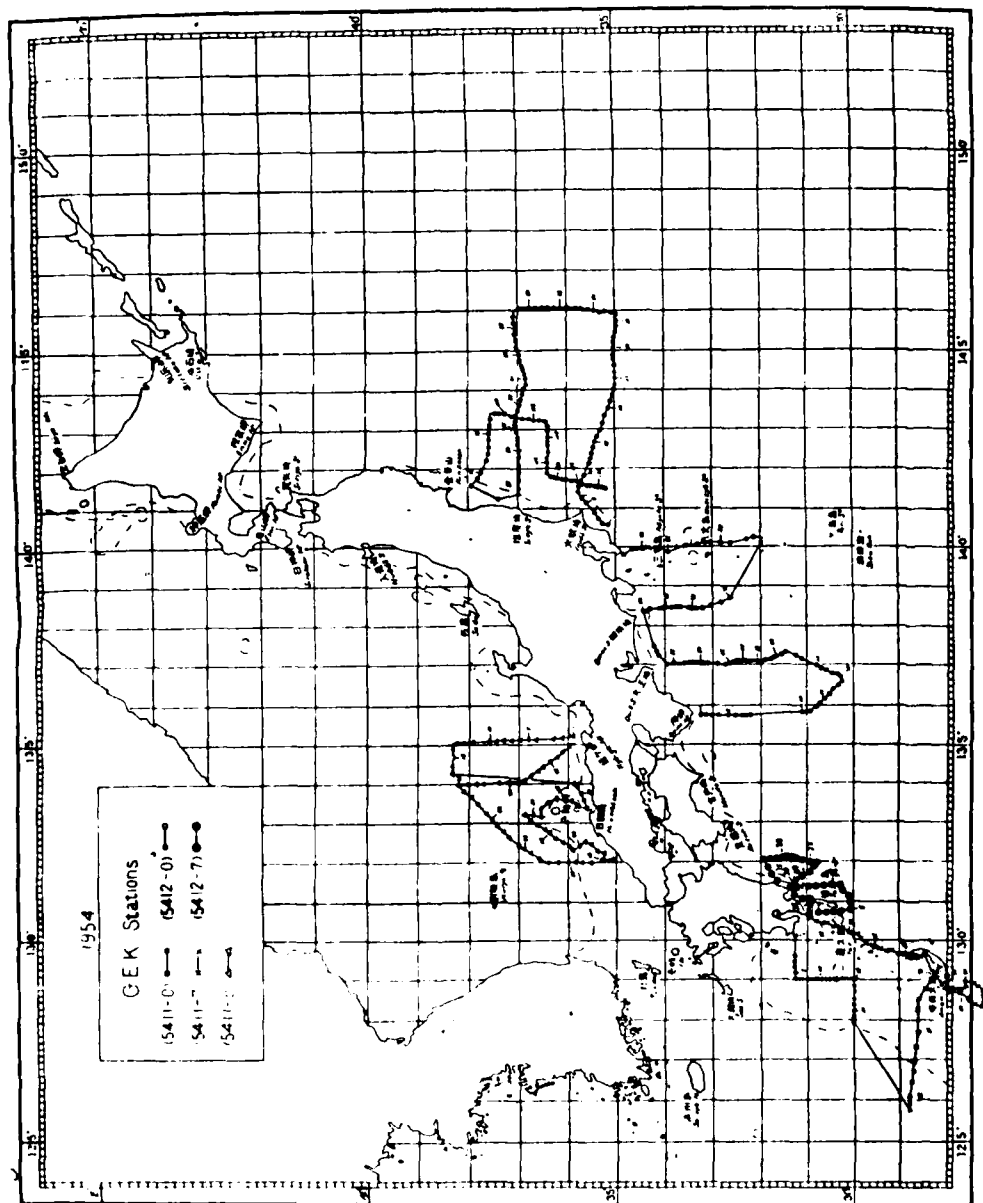
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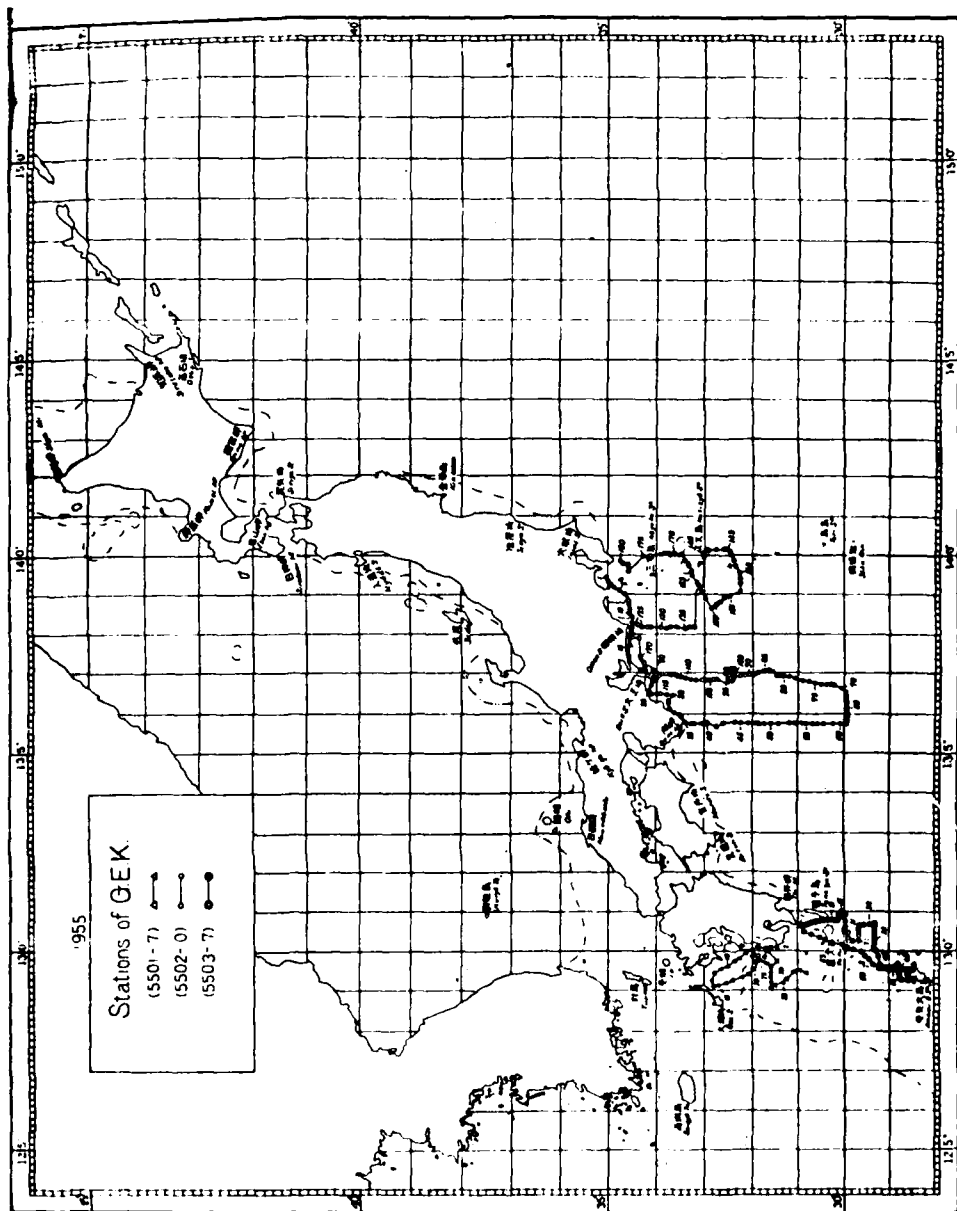
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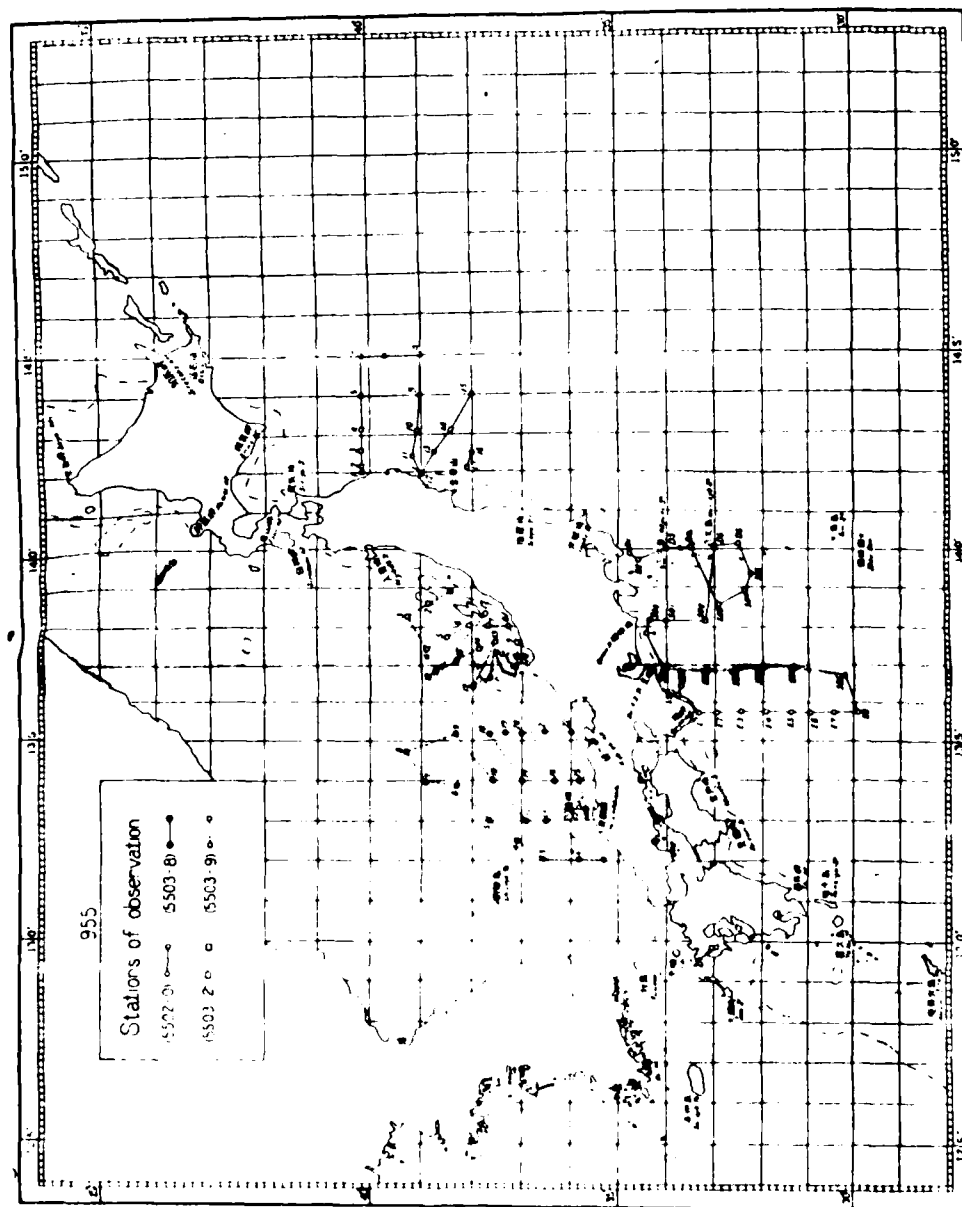
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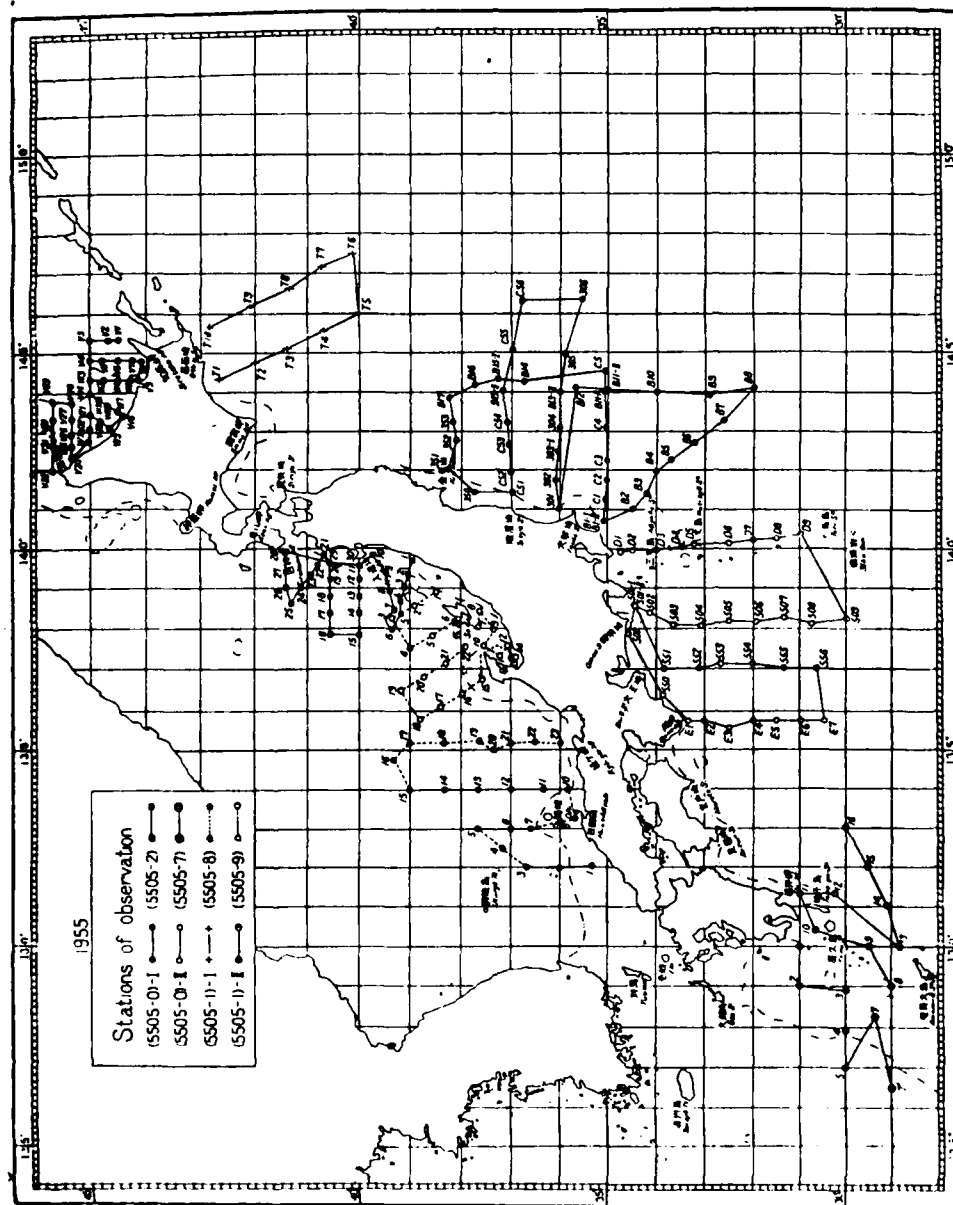
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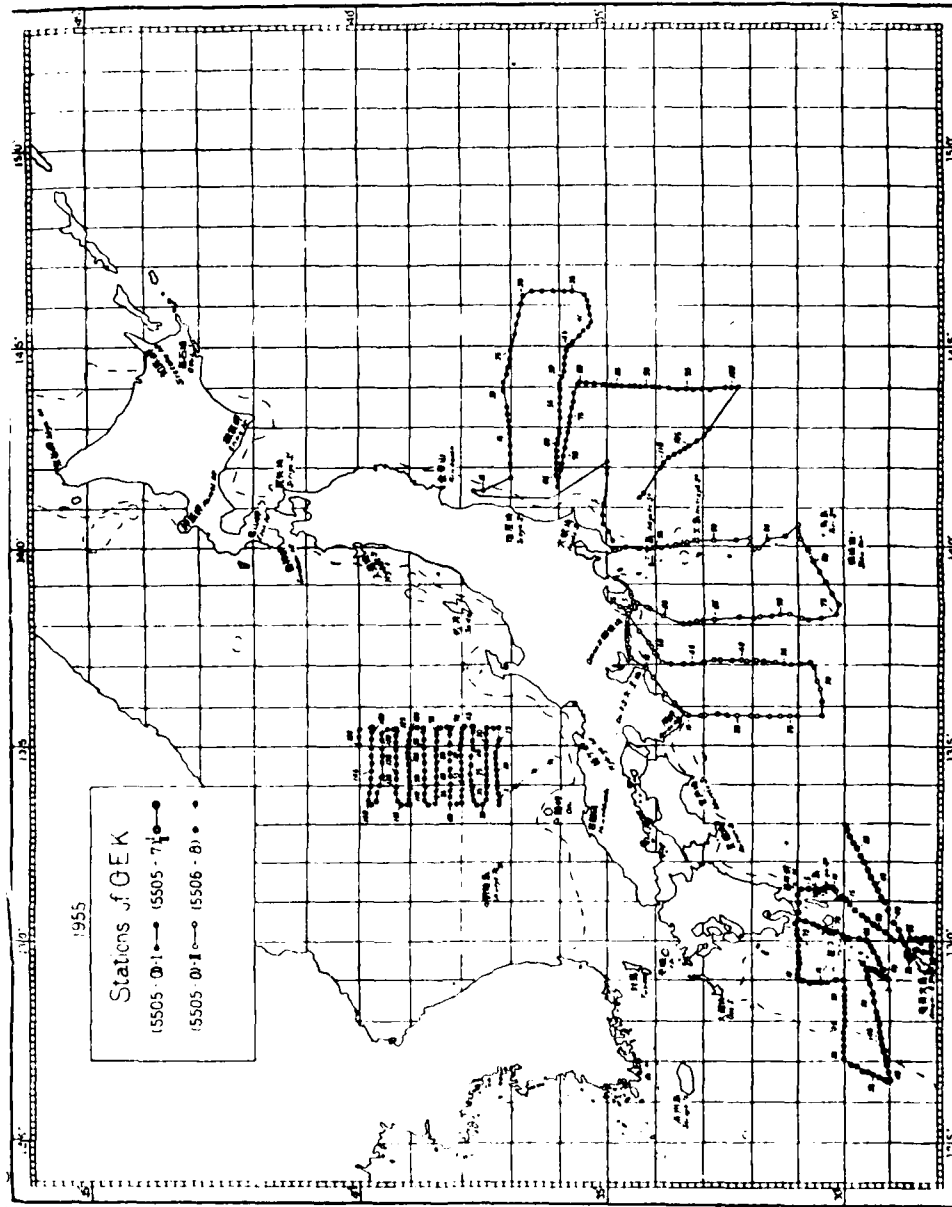
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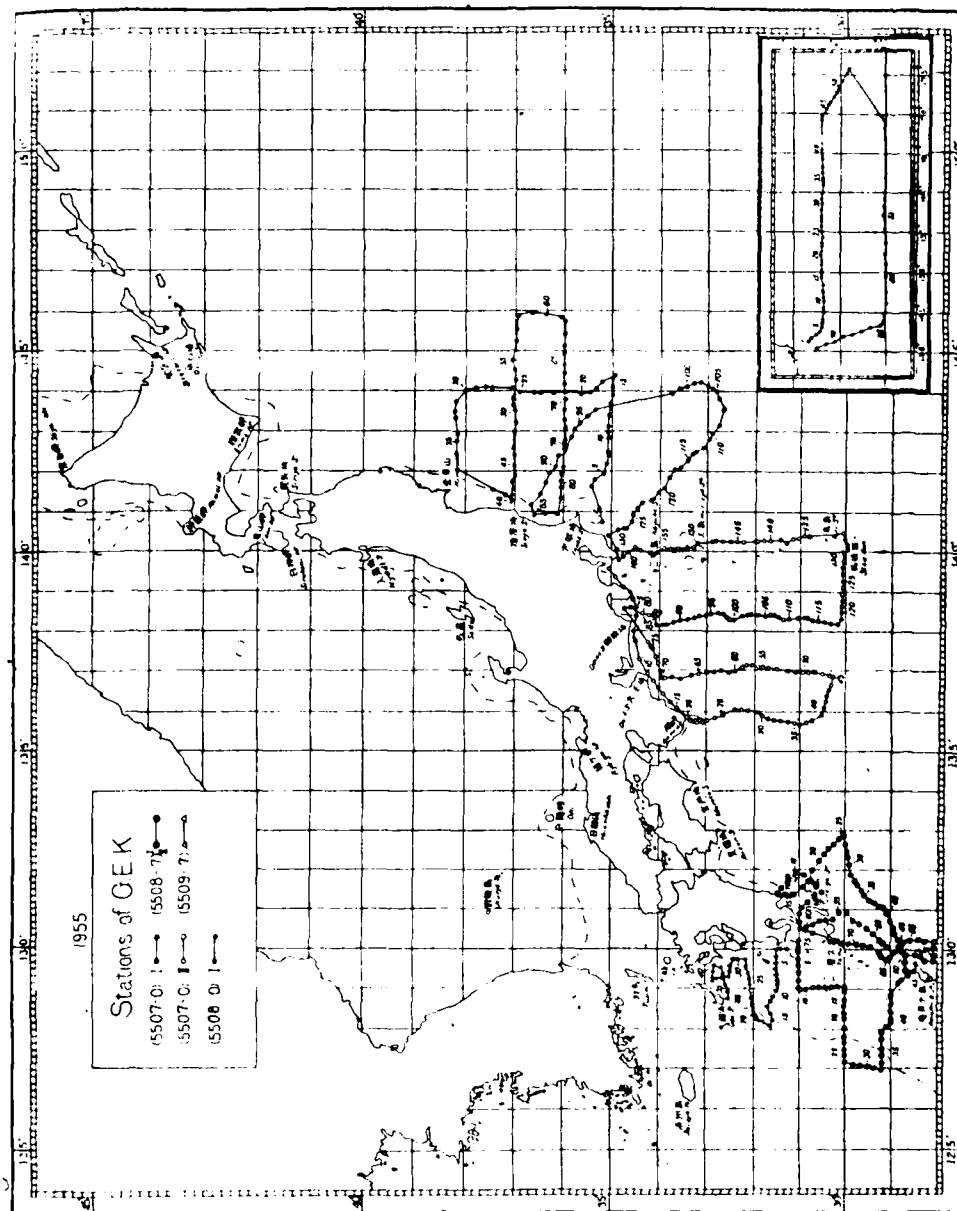
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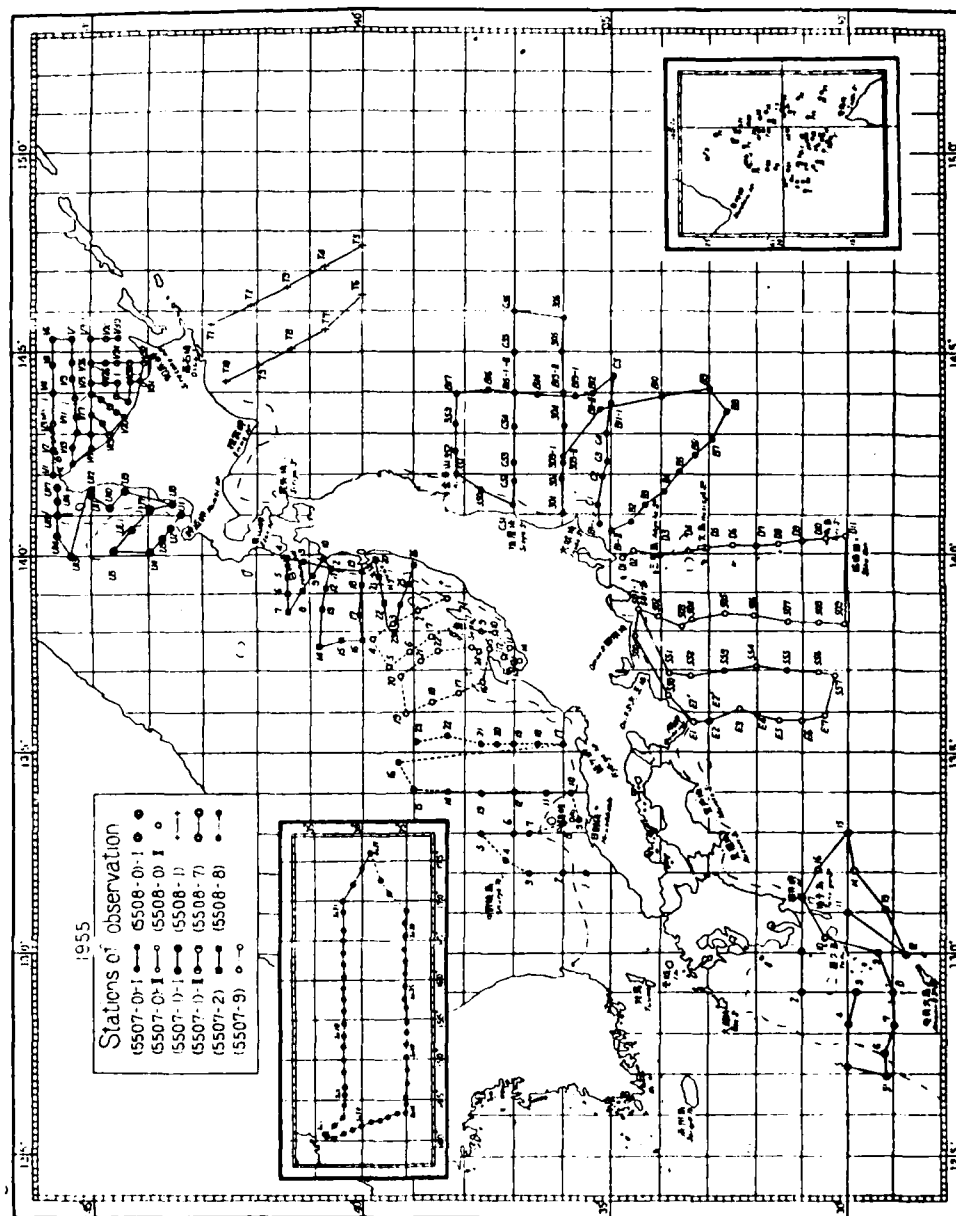
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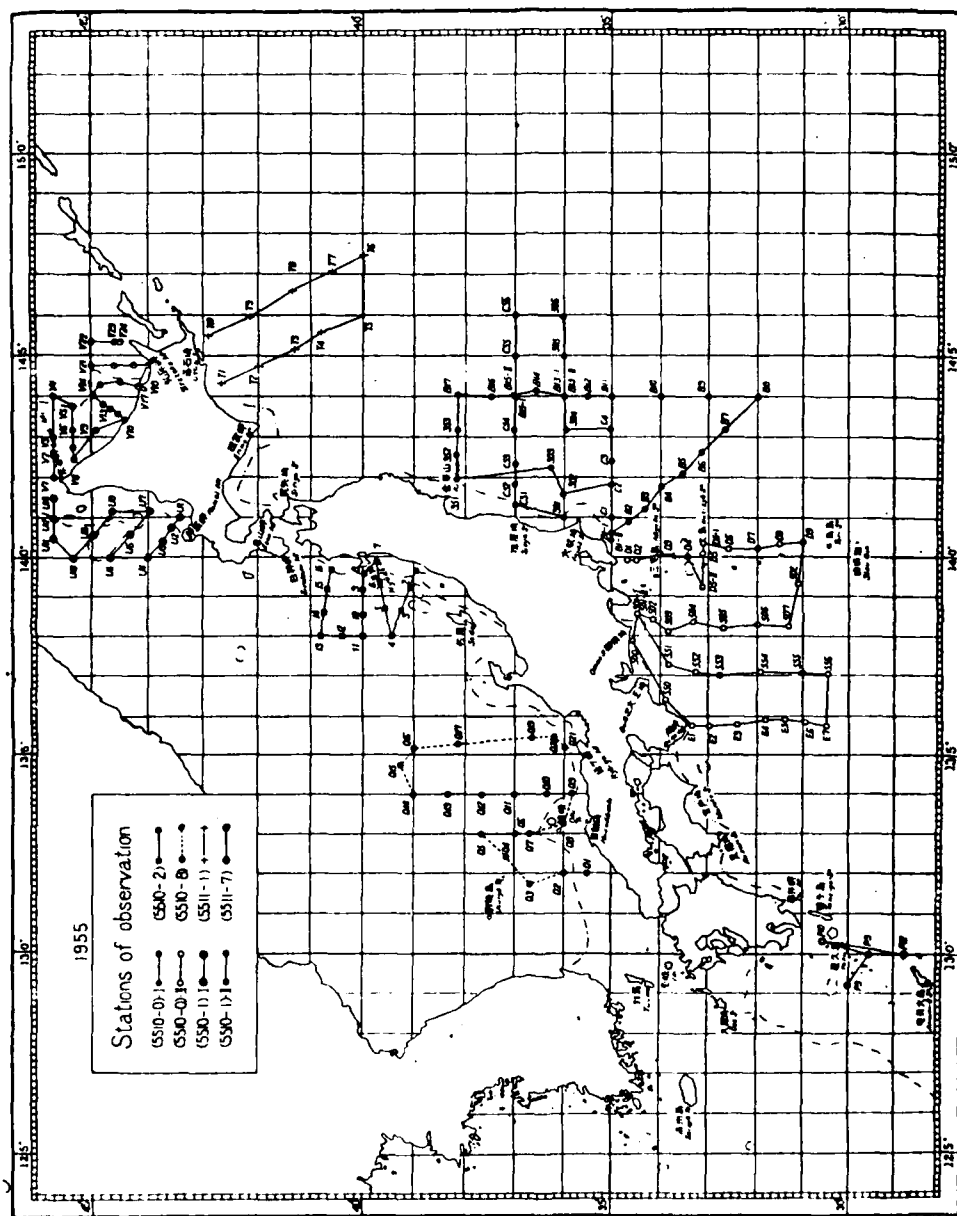
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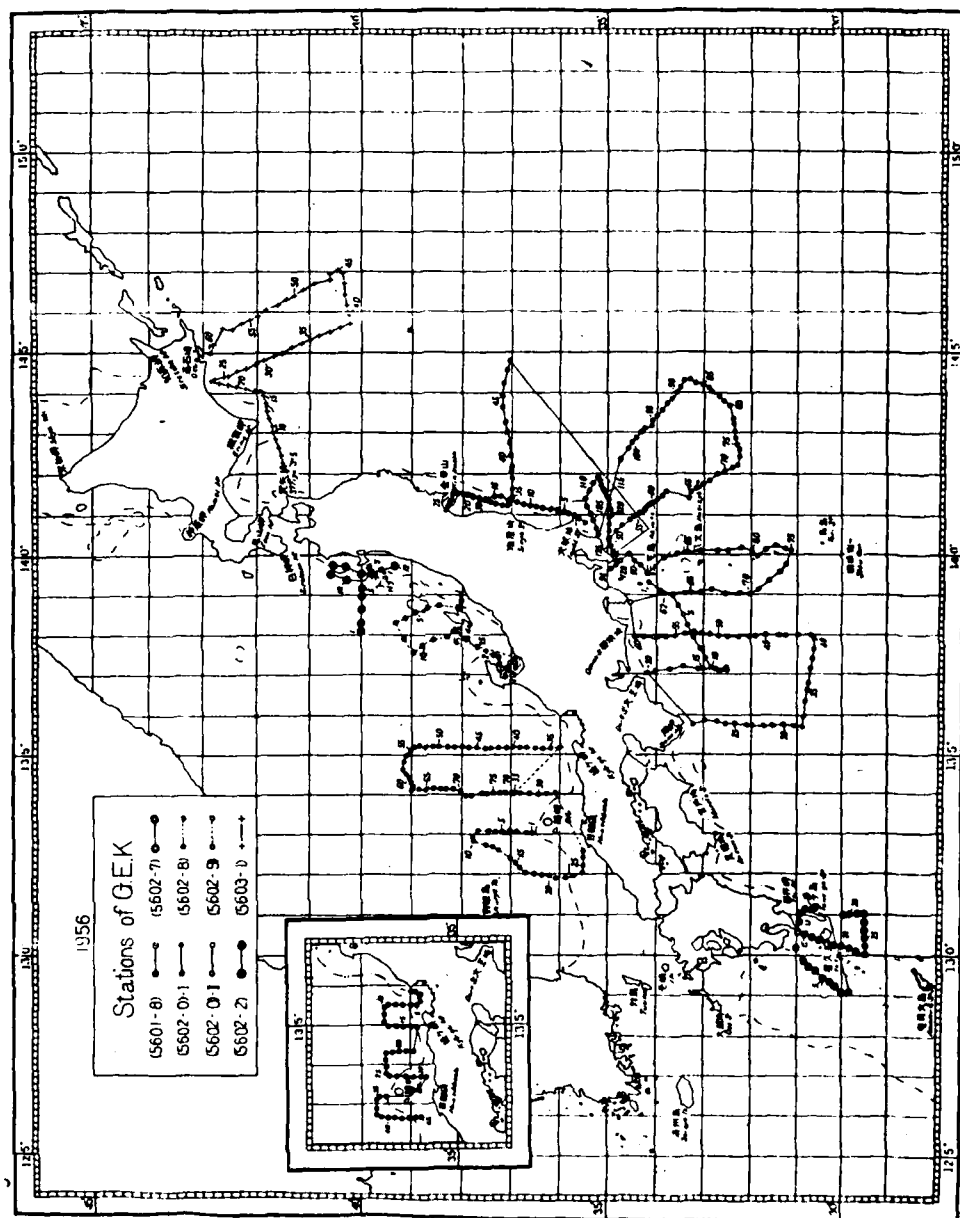
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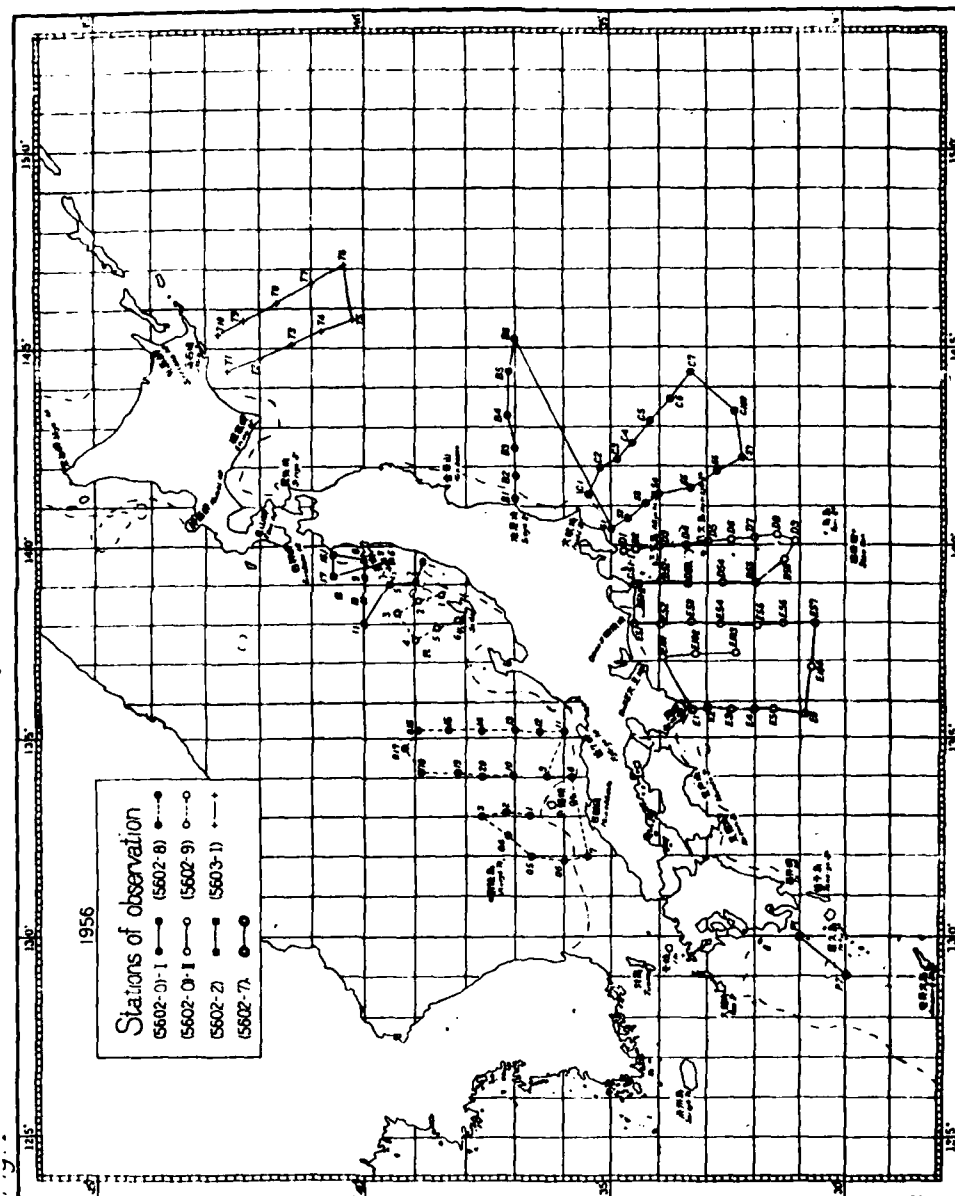
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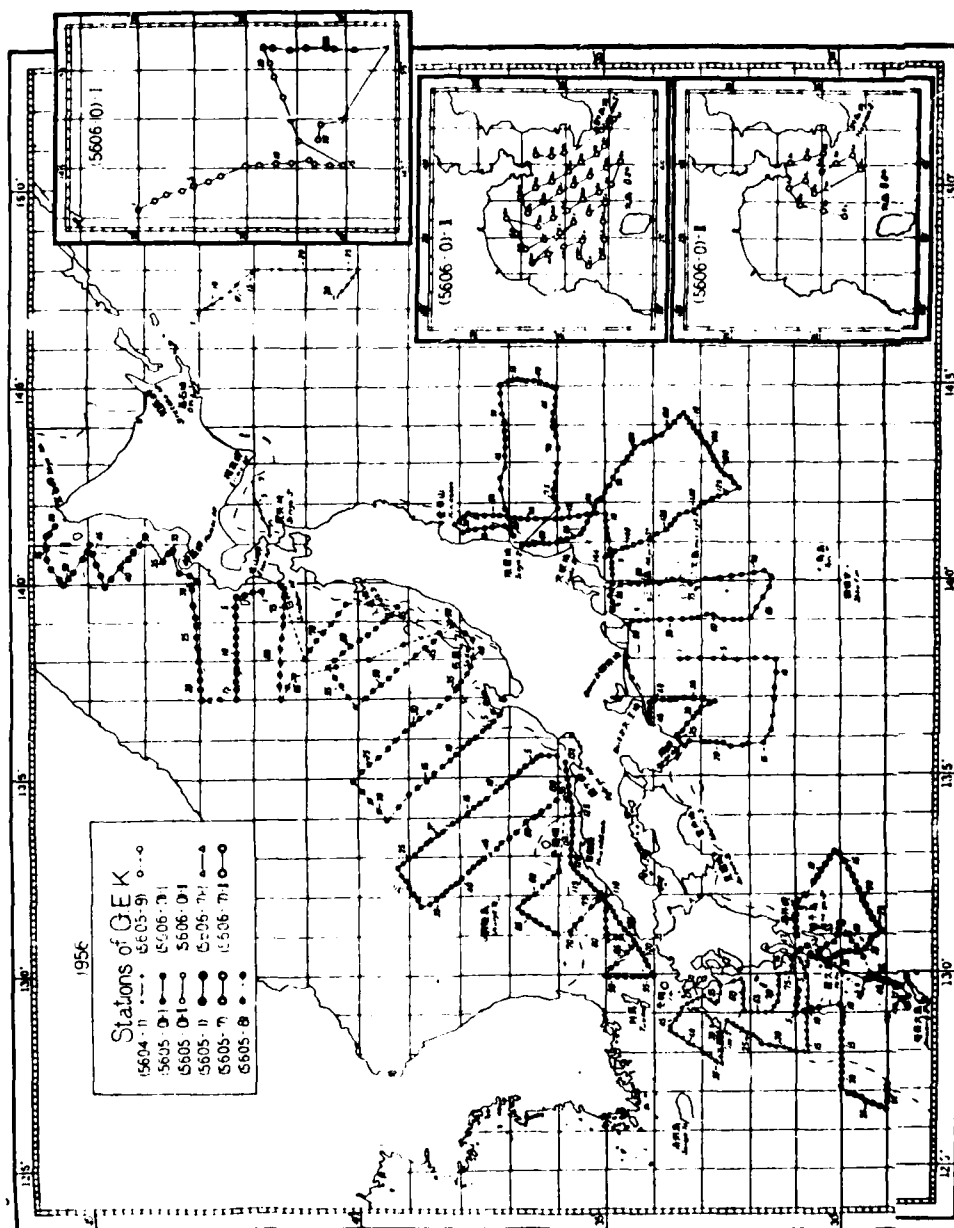
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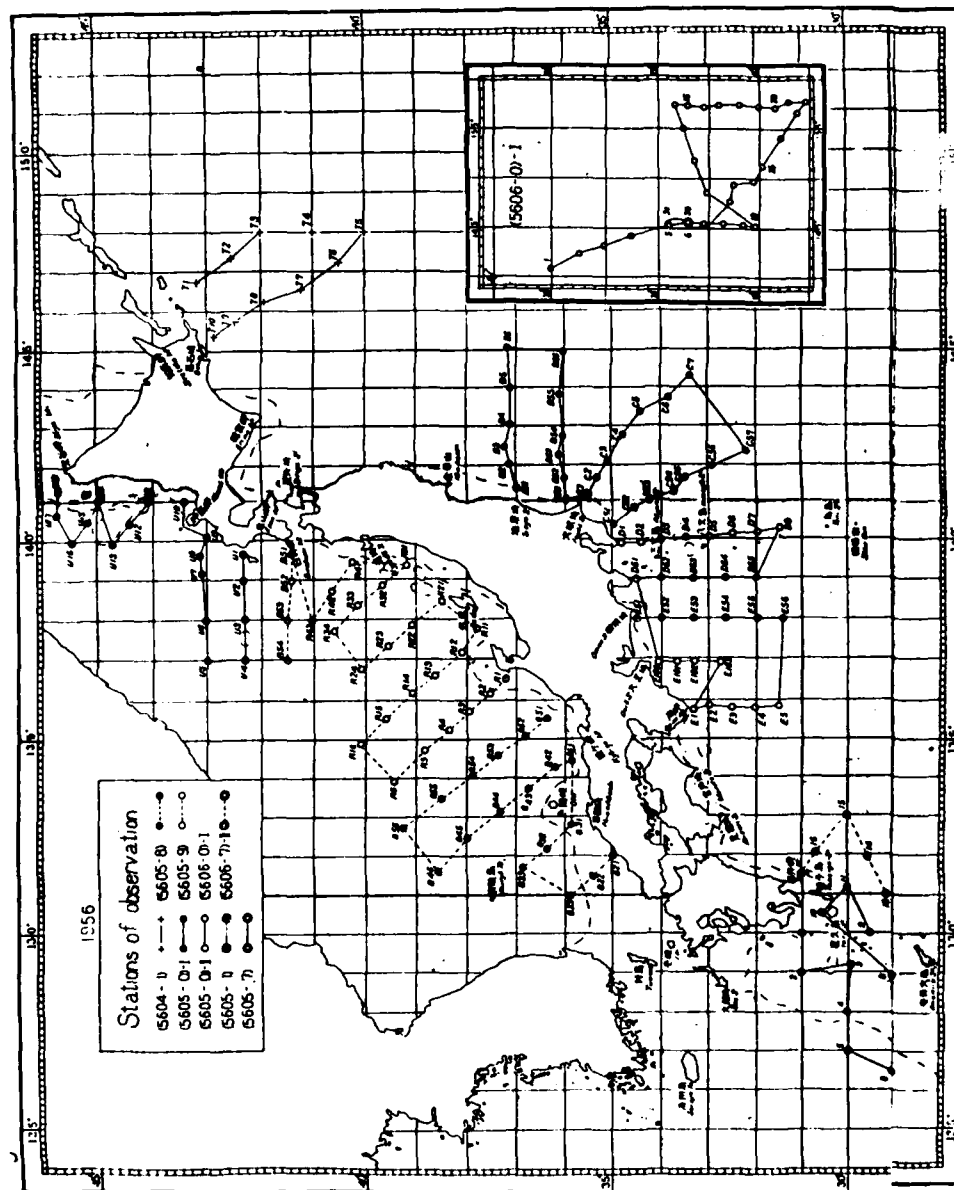
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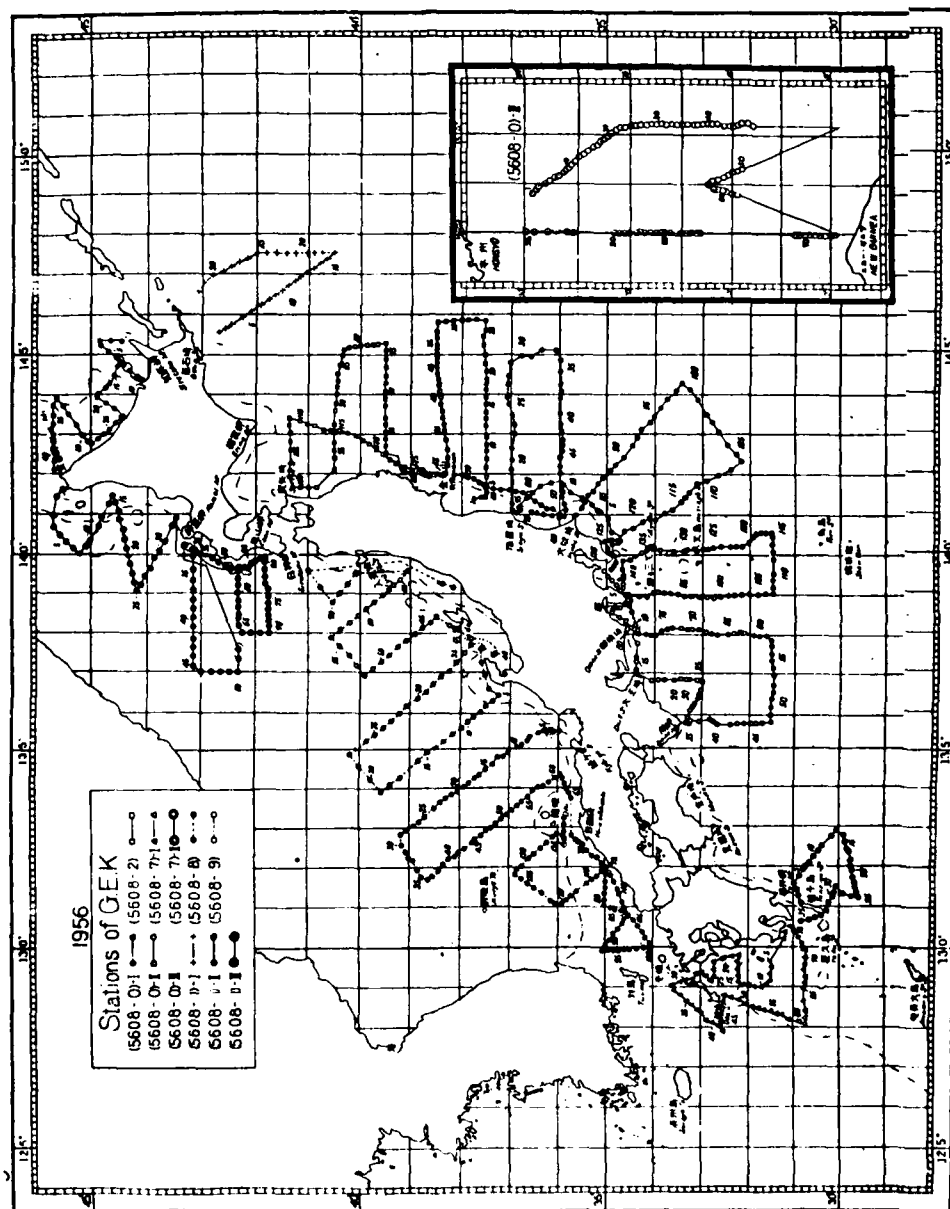
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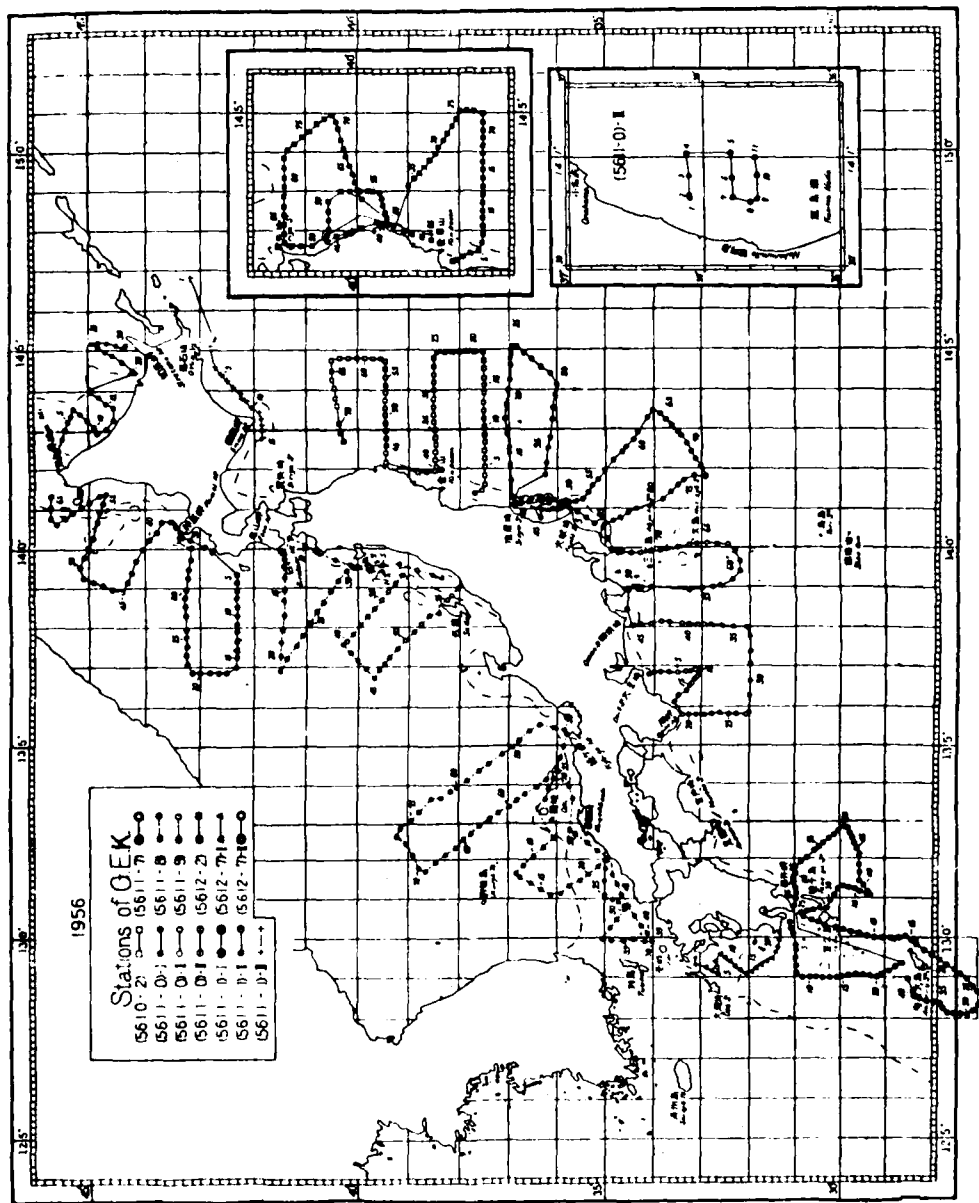
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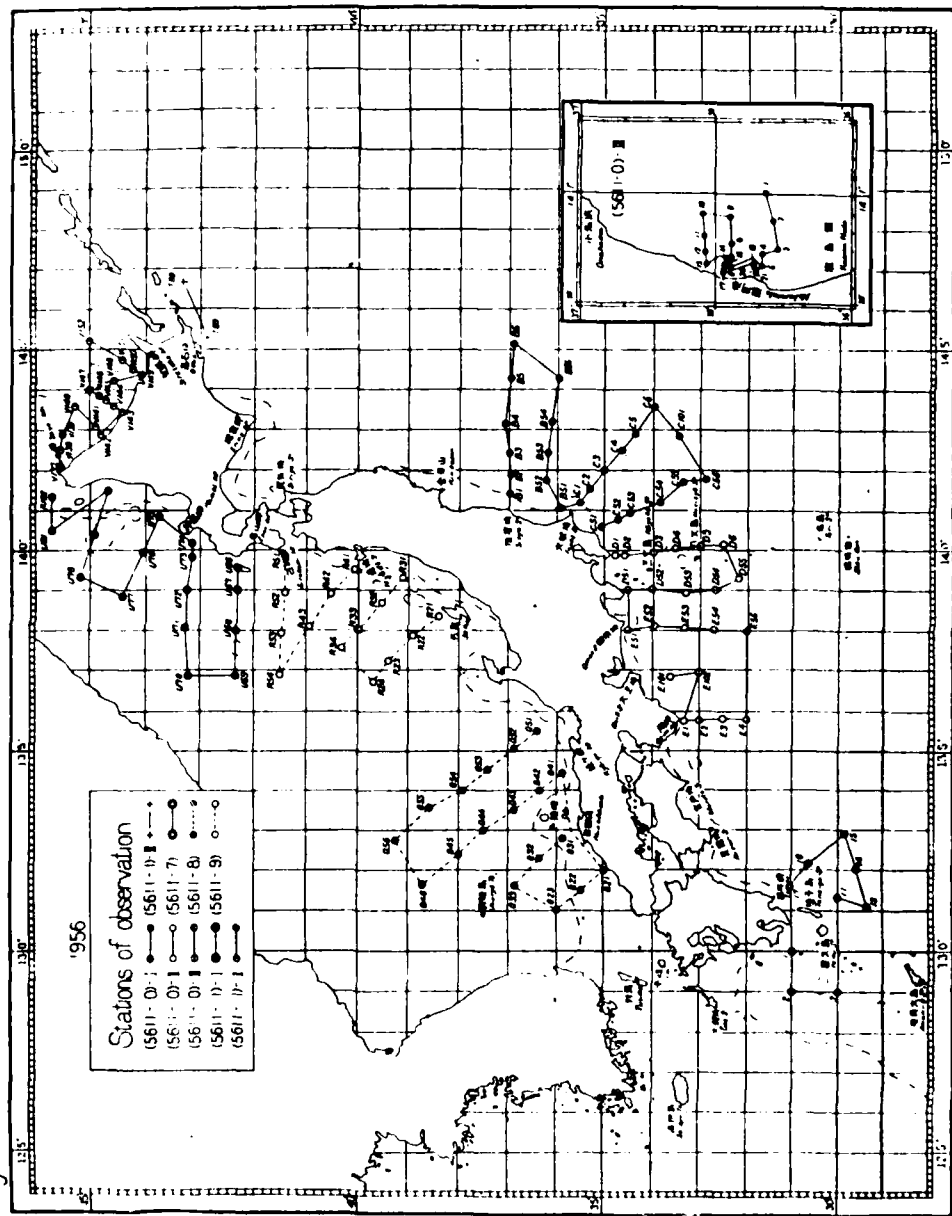
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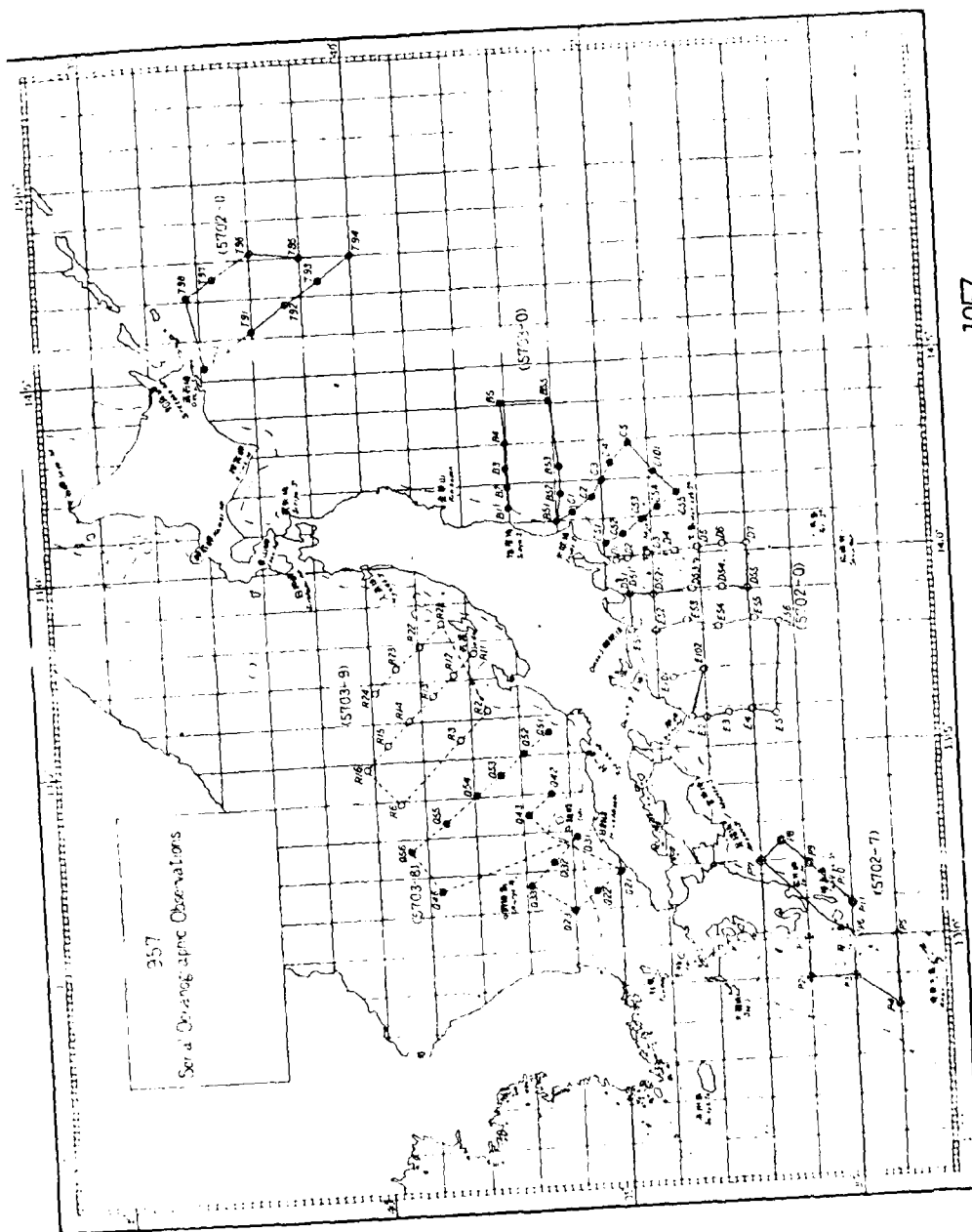
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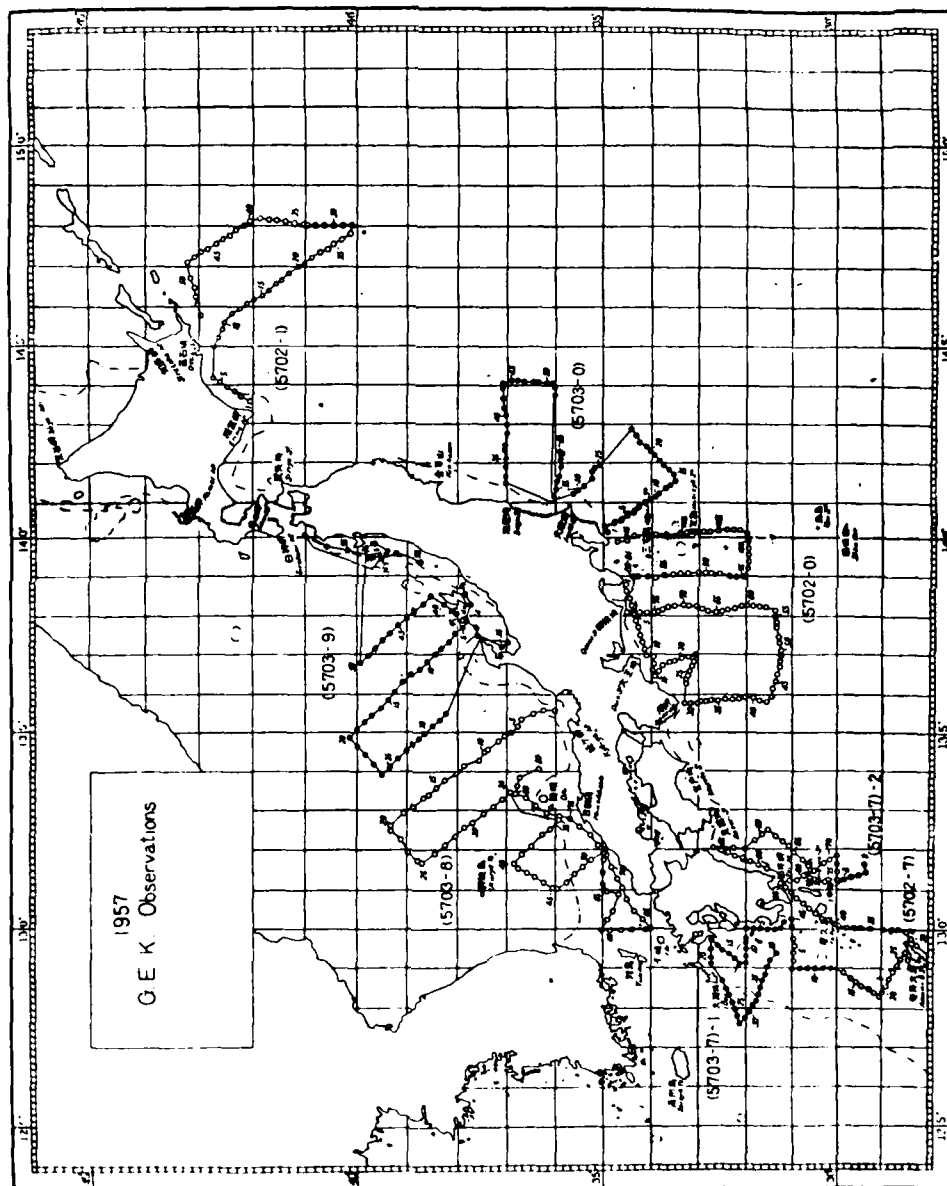


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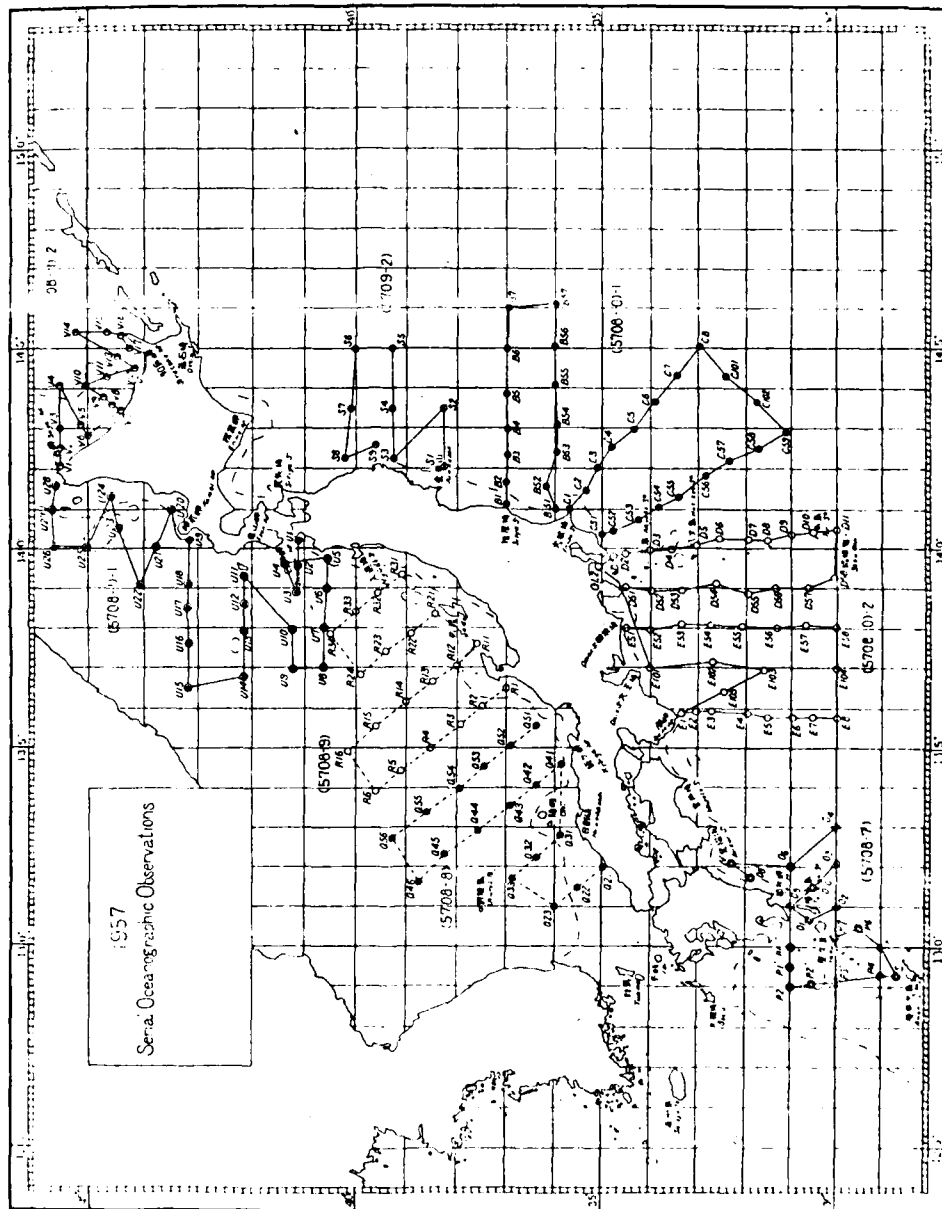


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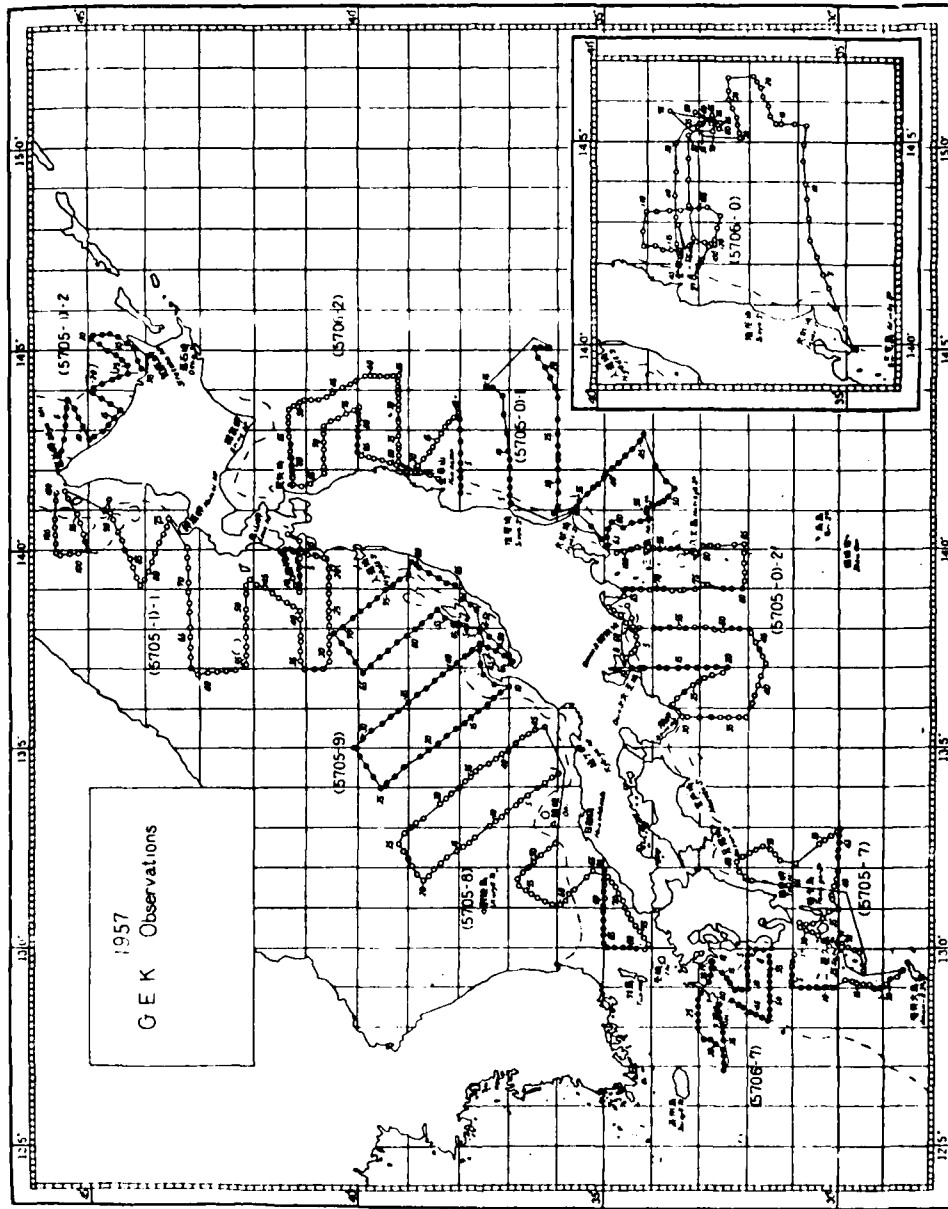




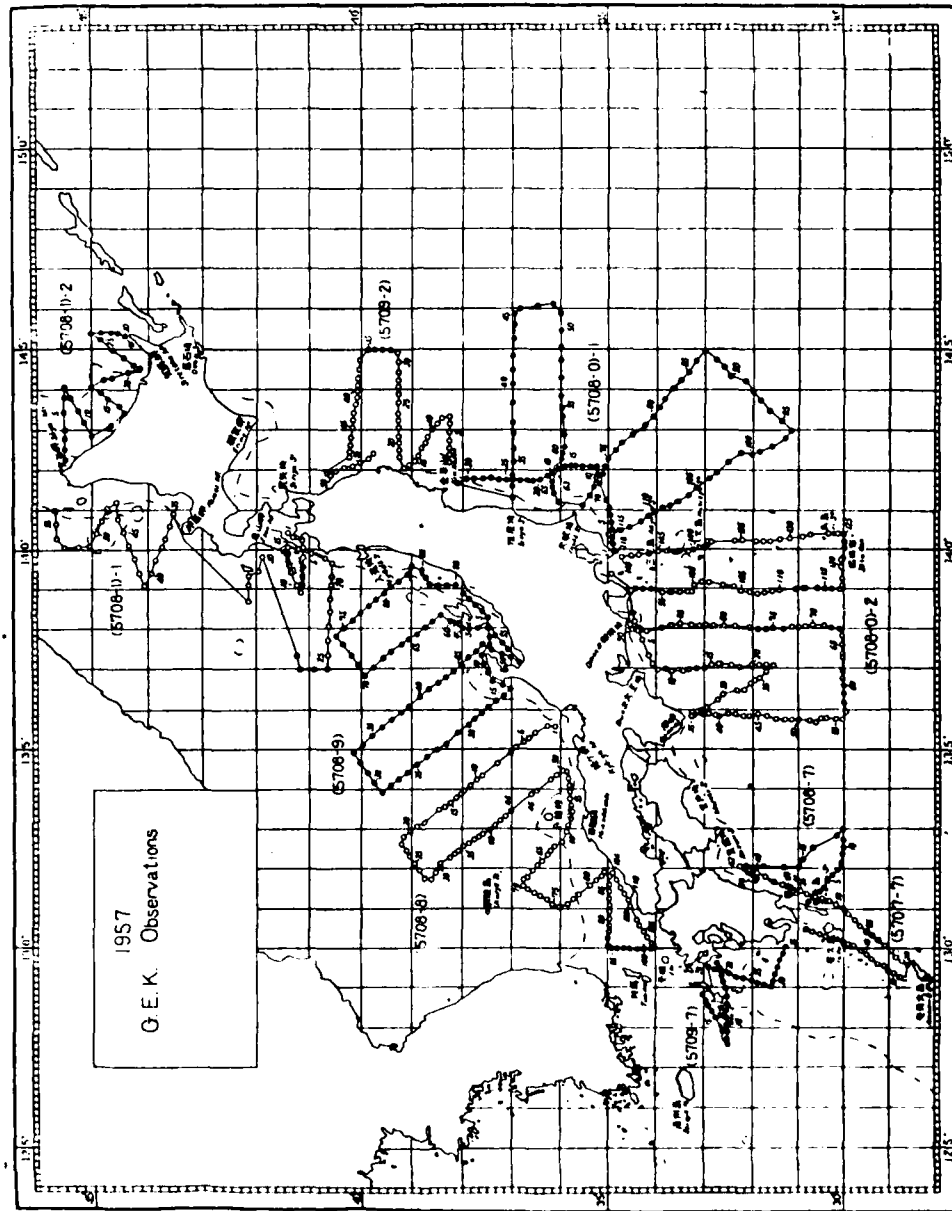
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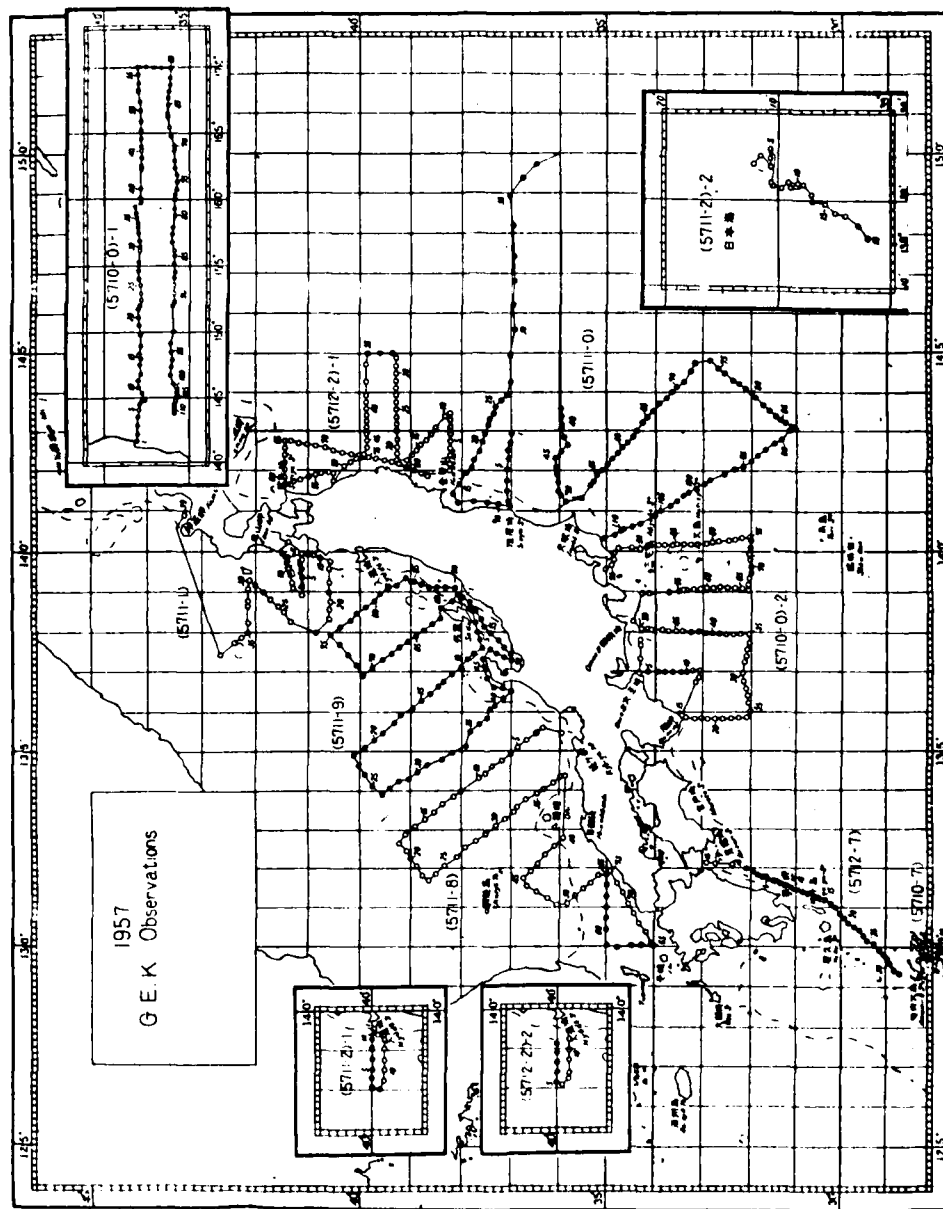
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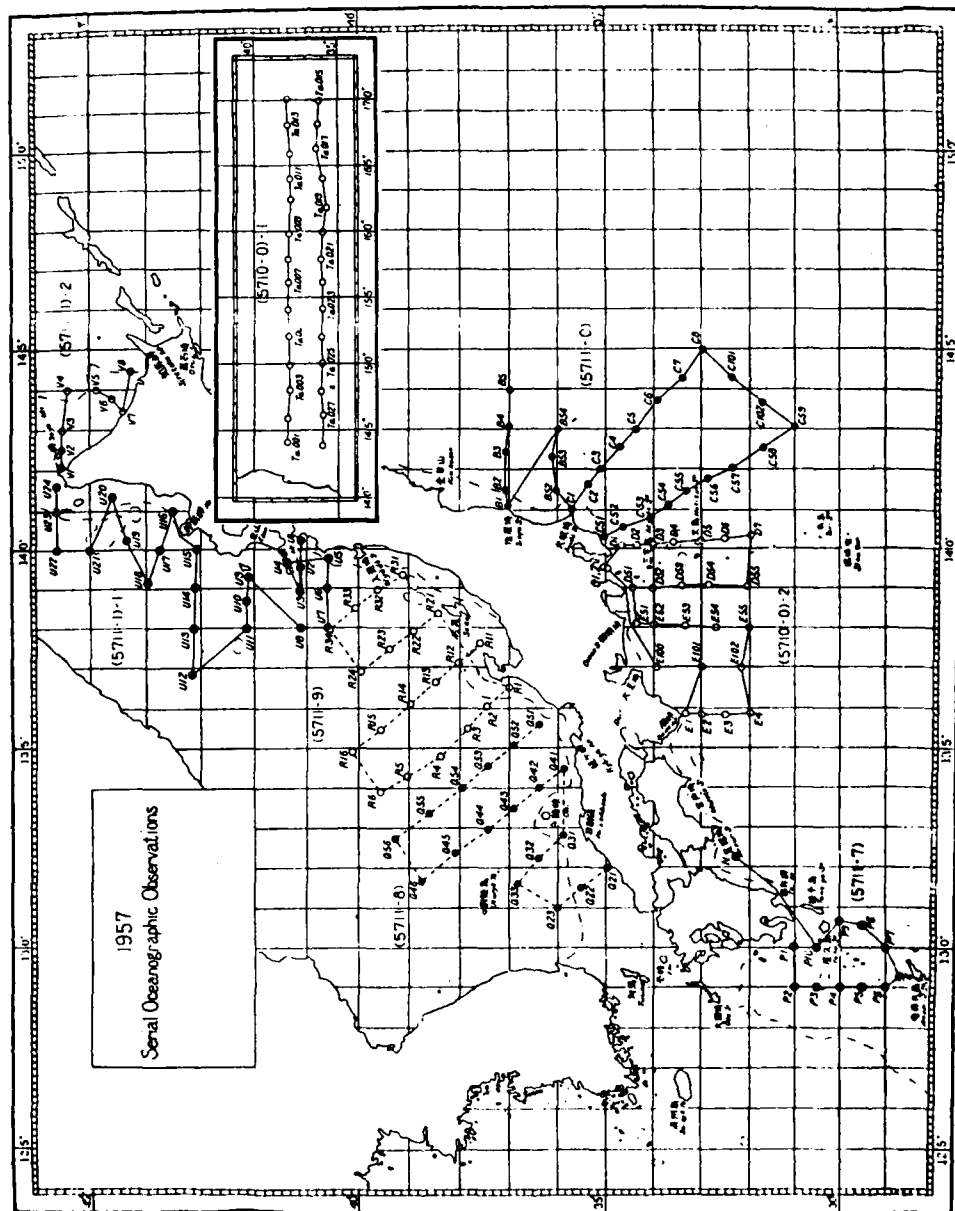
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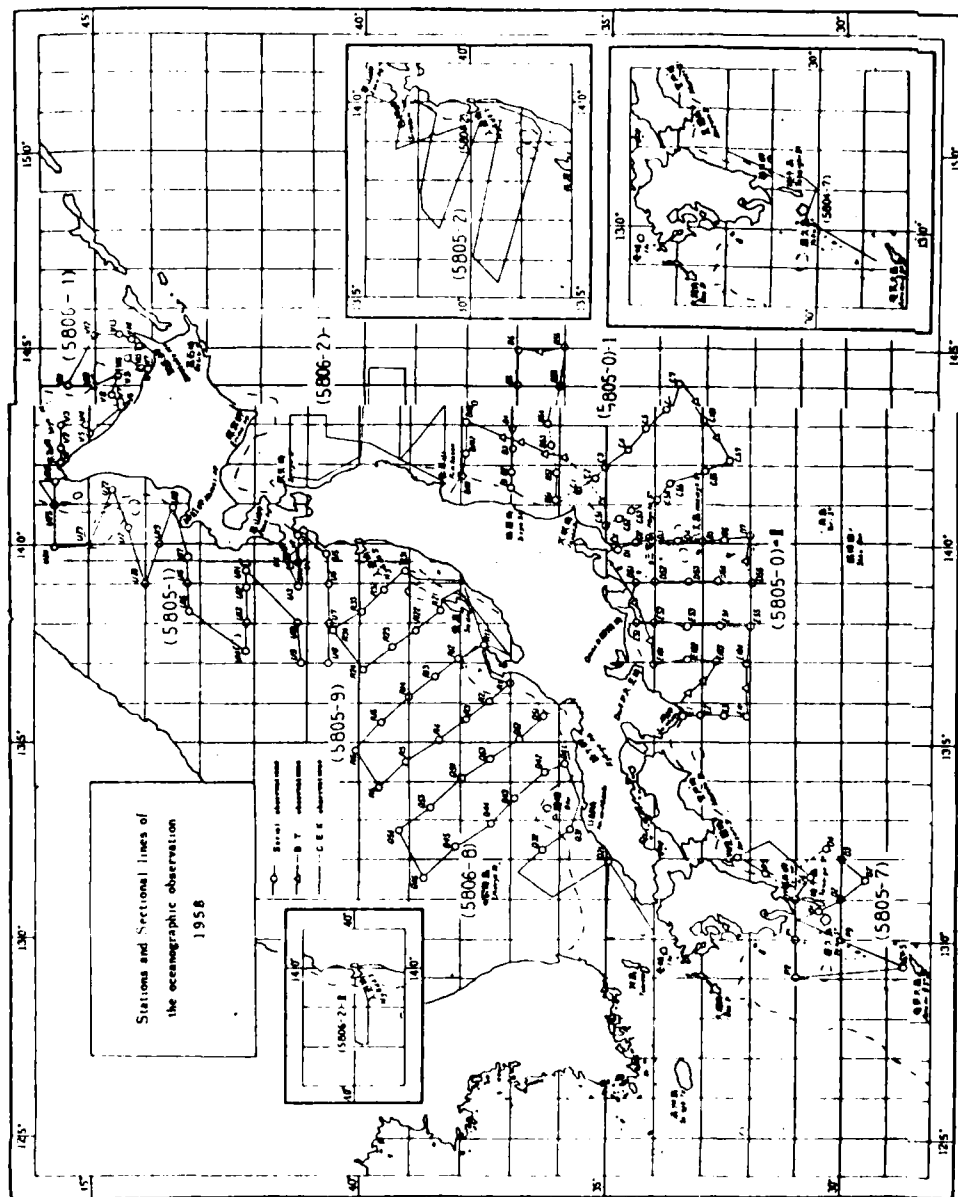
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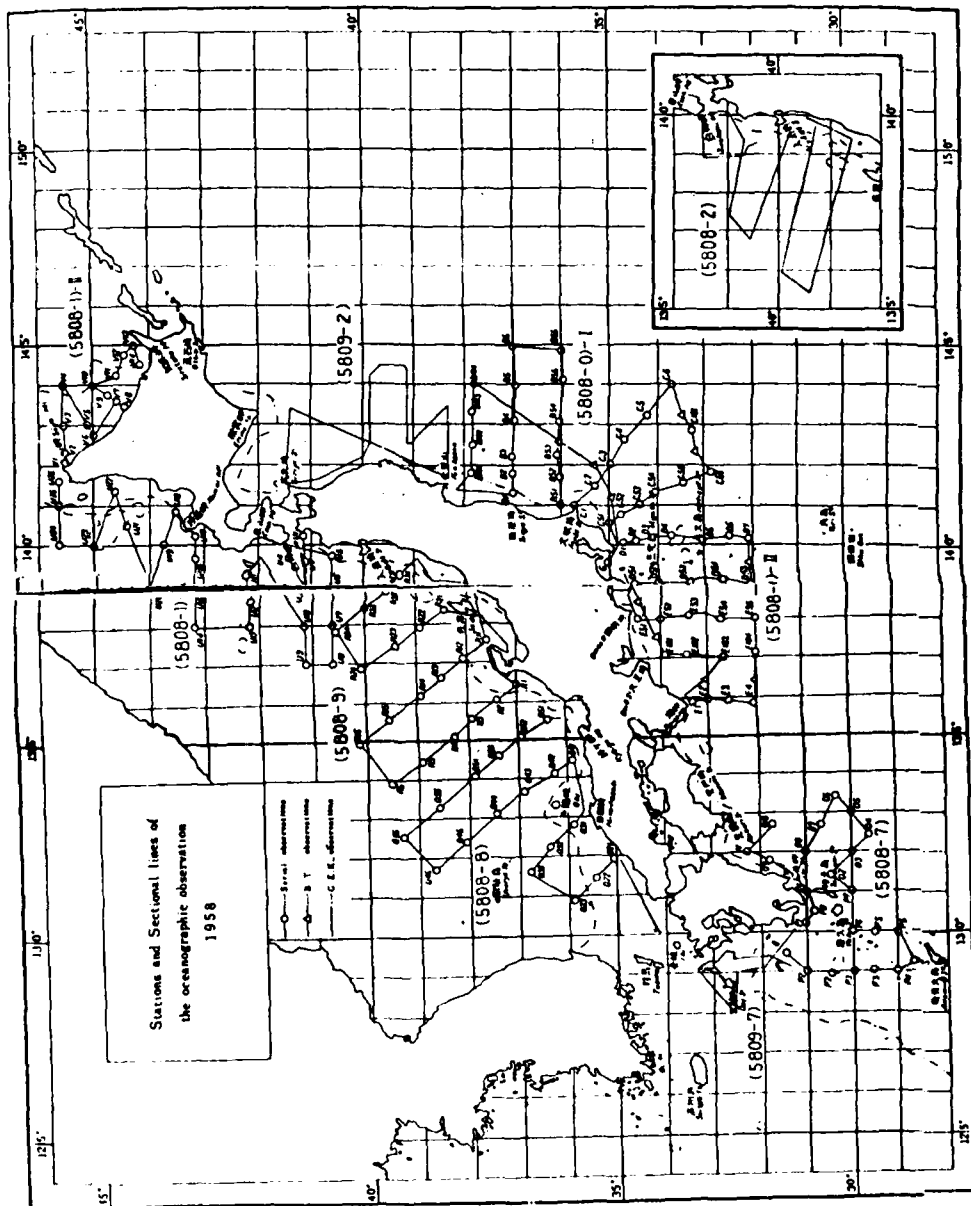


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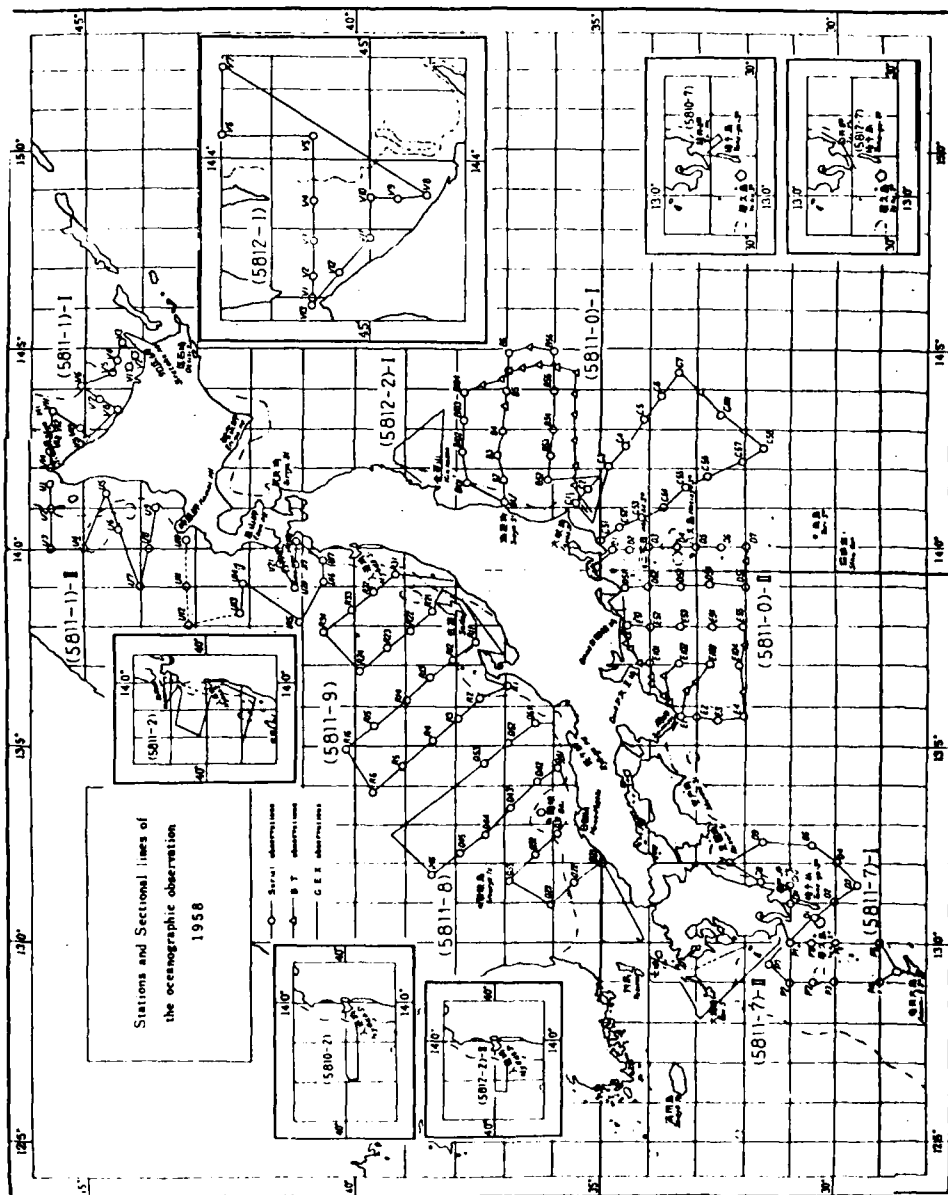


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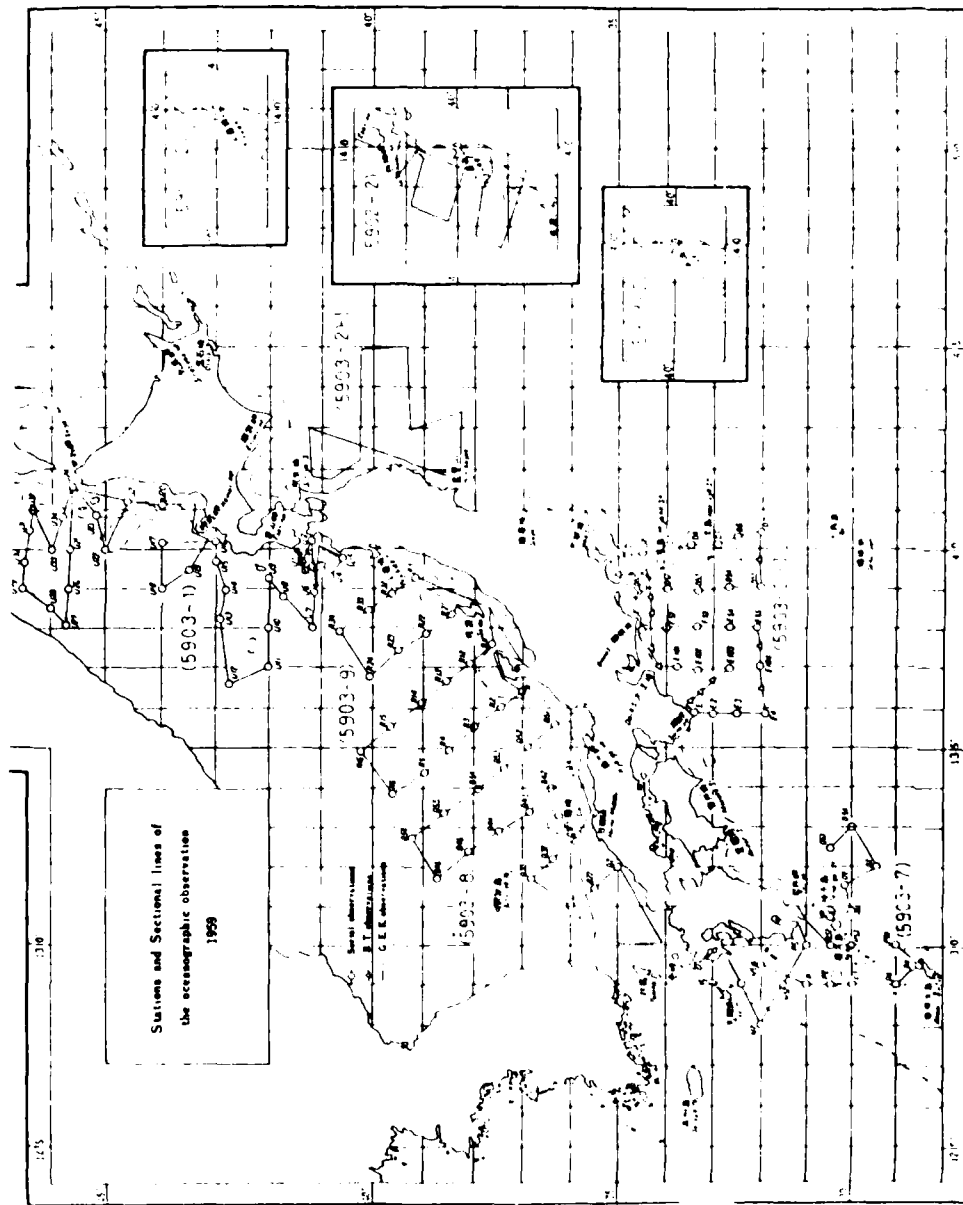




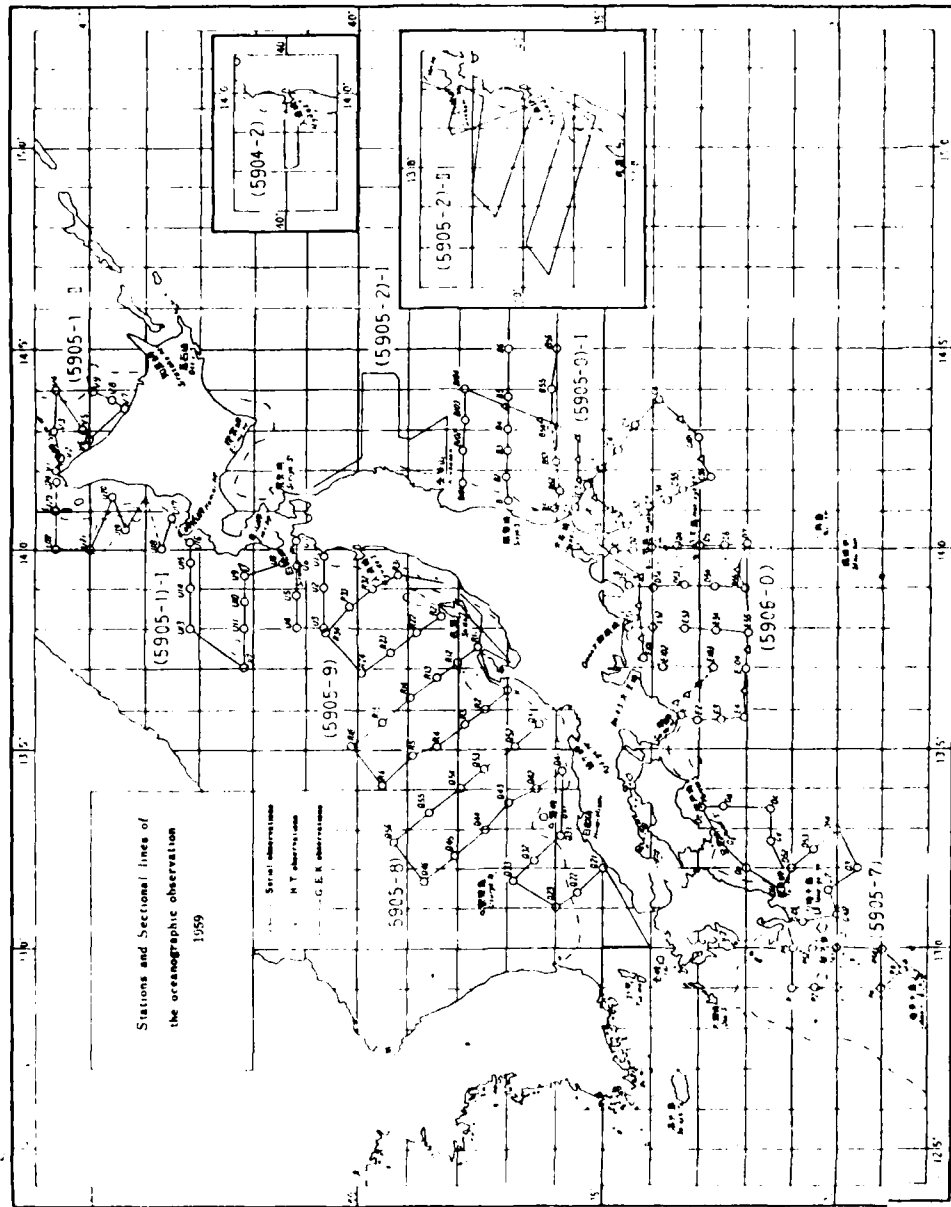
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1958



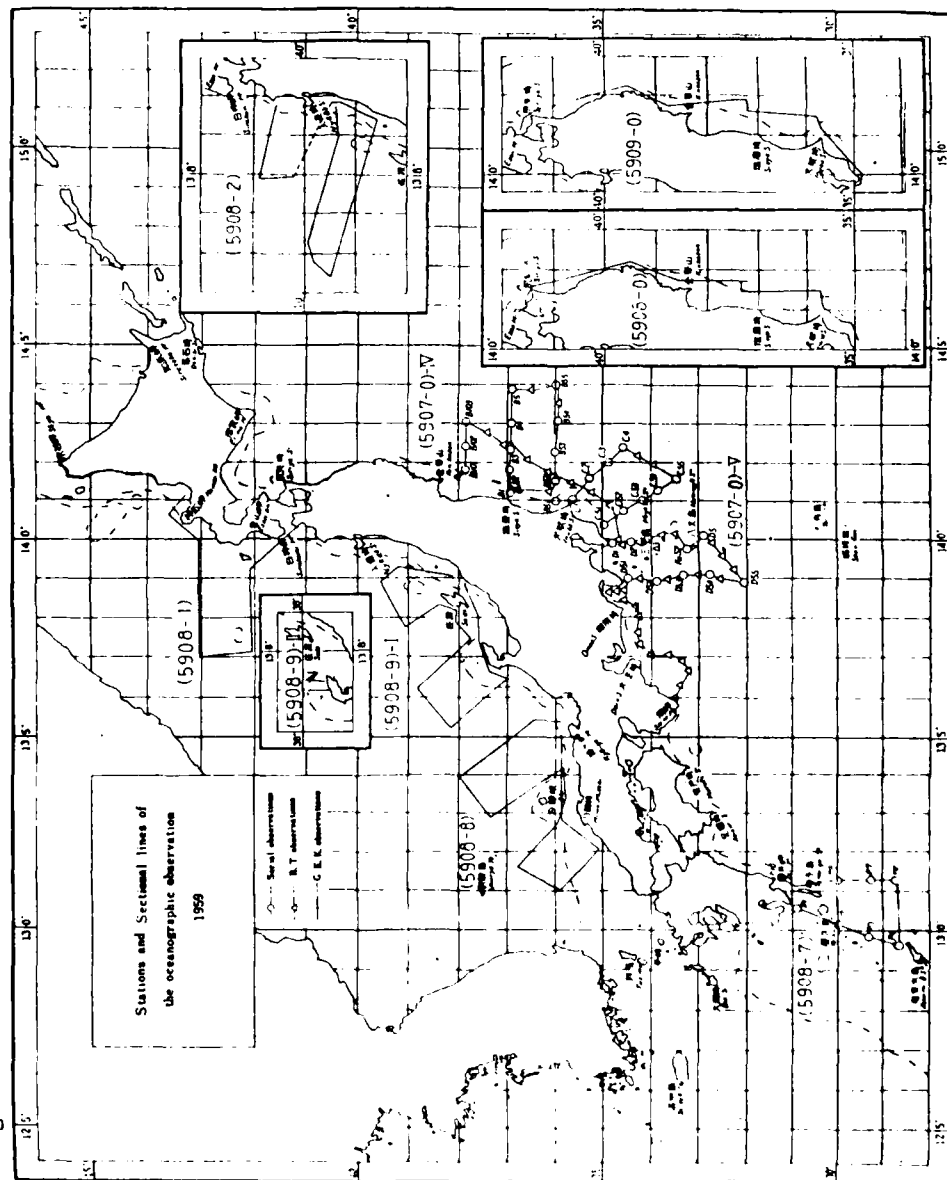
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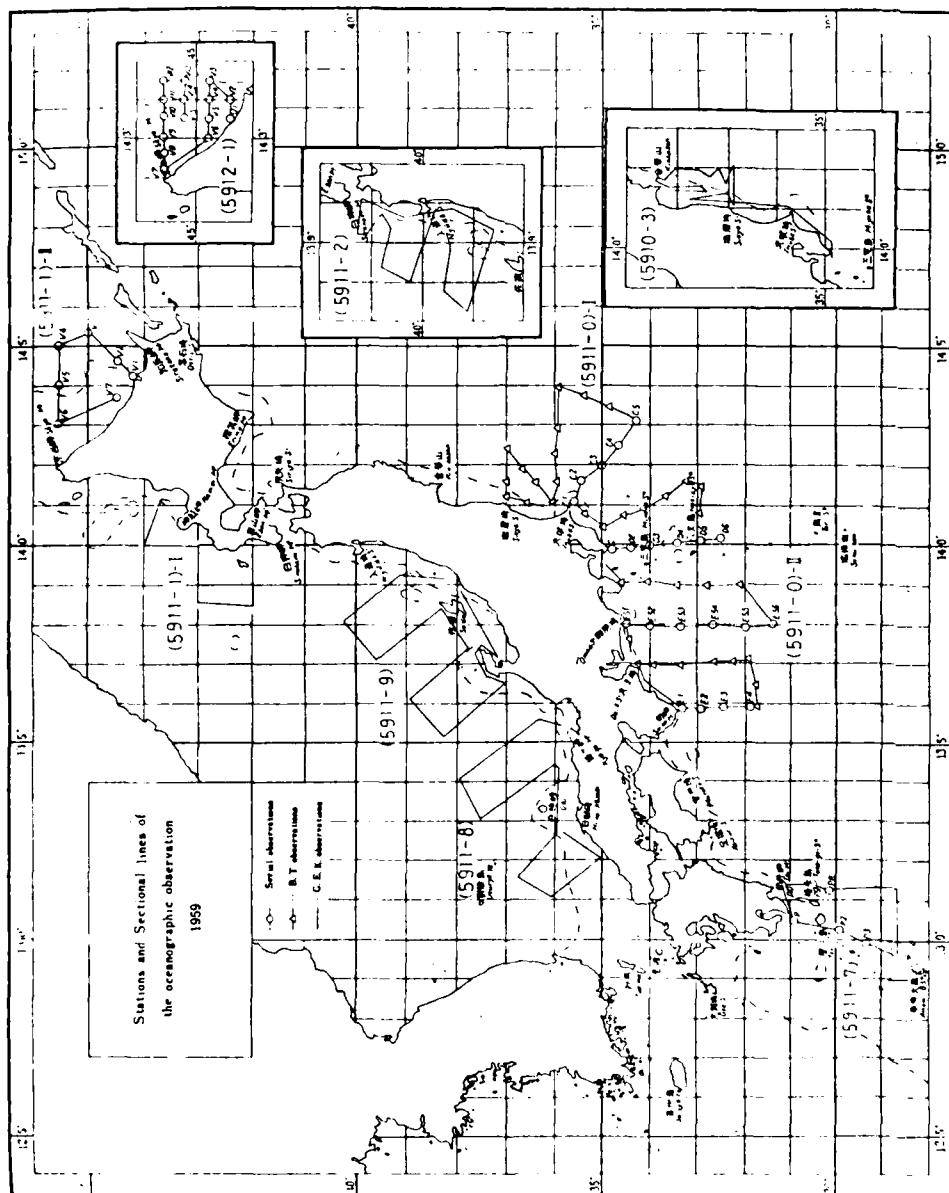
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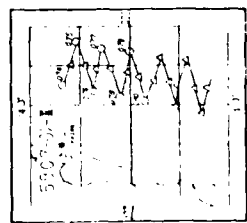
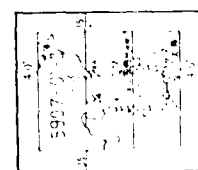
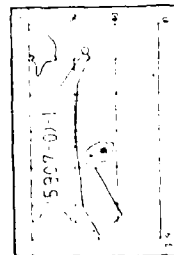
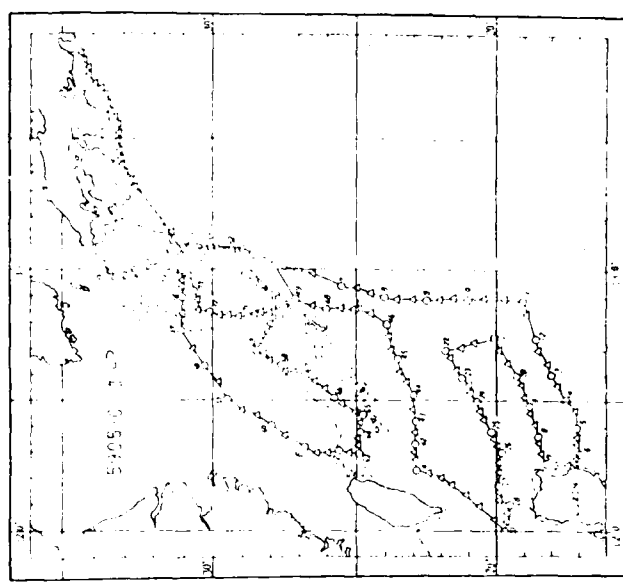
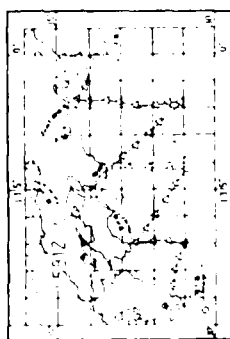
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1959



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1959

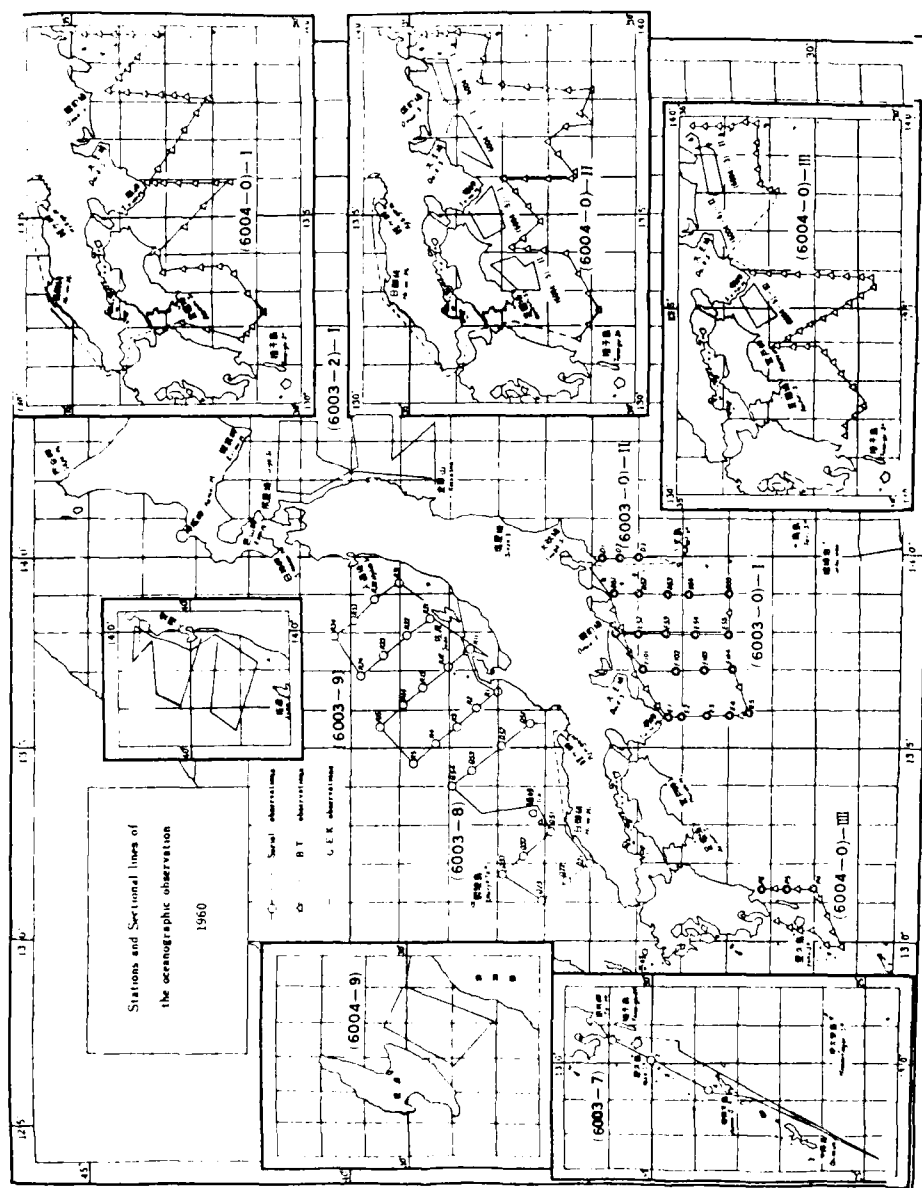


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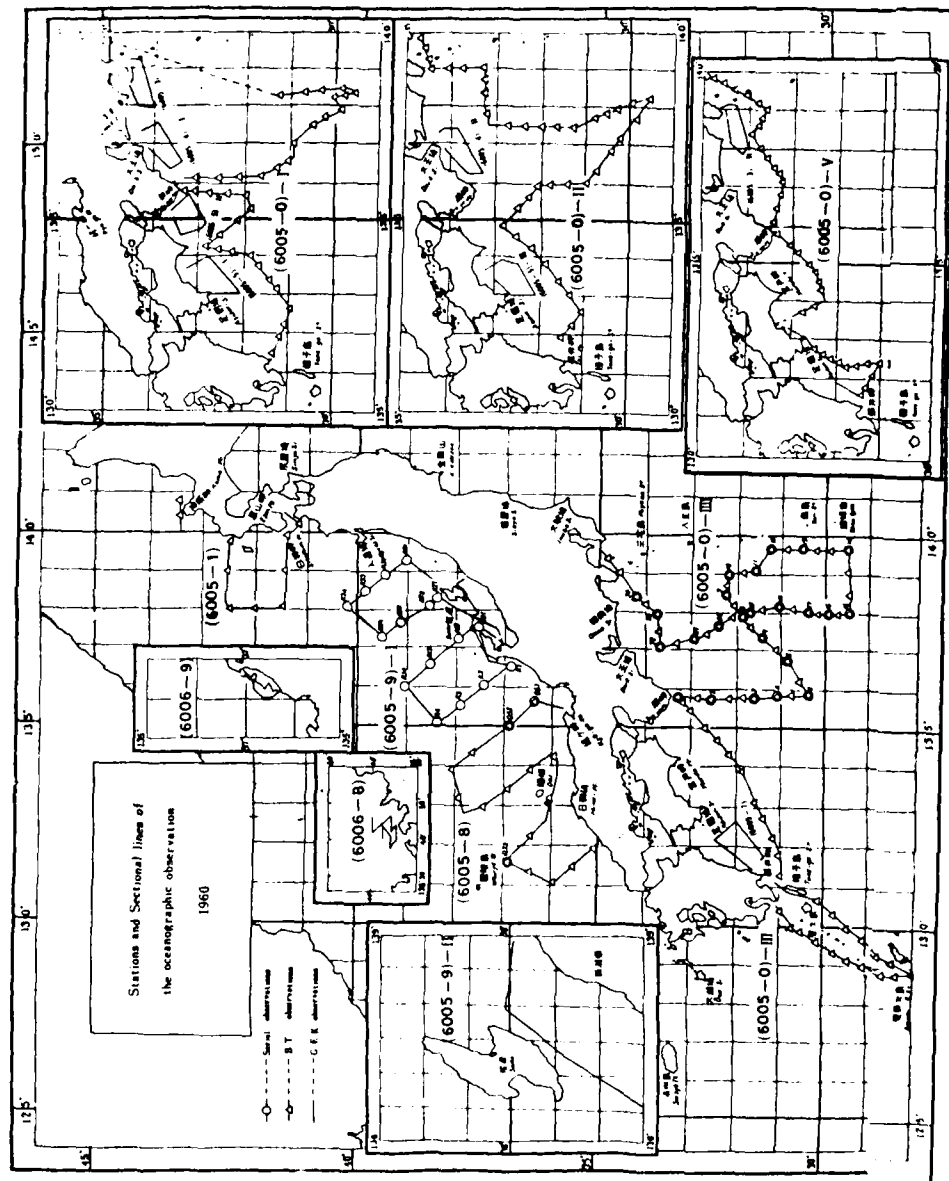


Stations and Sectional lines of
 the oceanographic observation
 1959

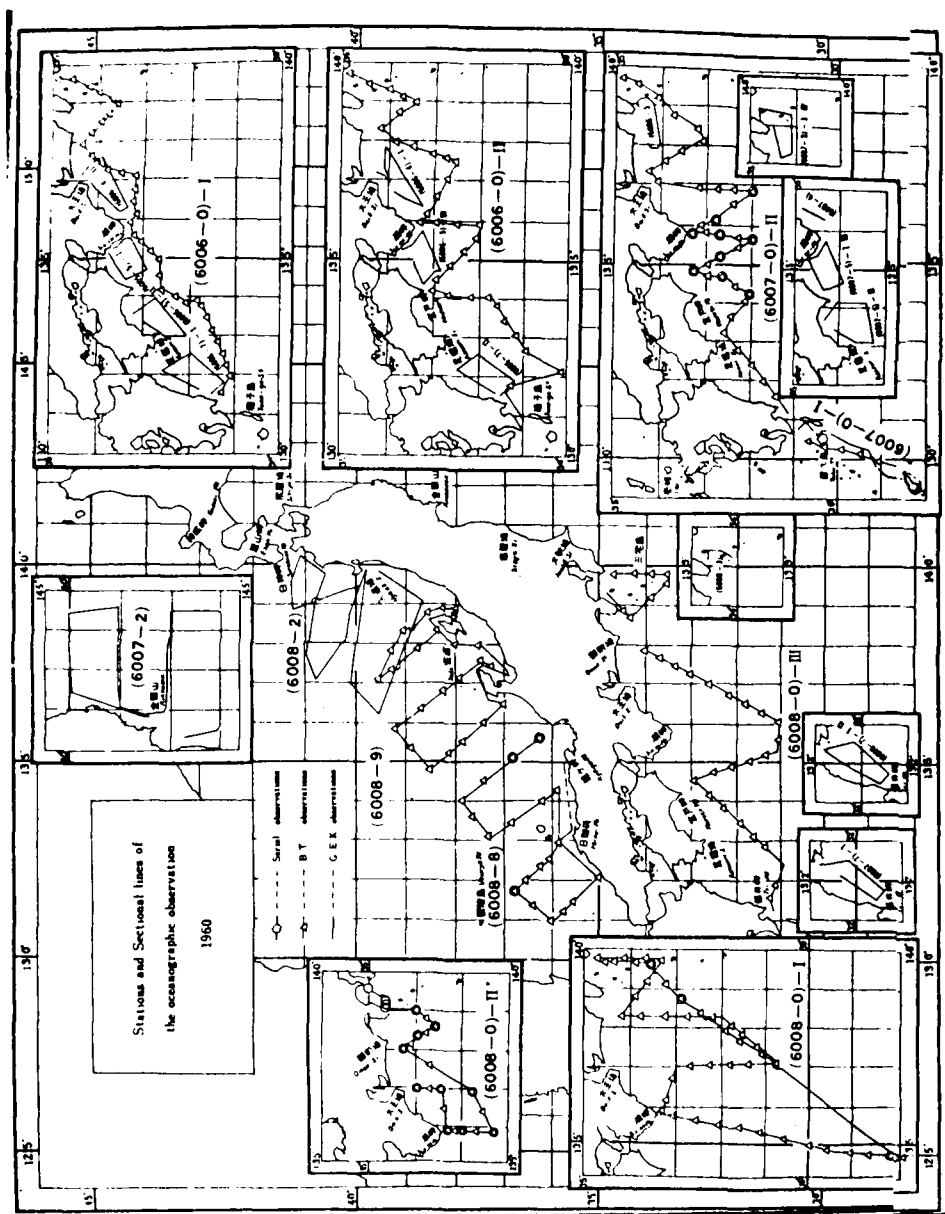
1. Sea observations
 2. R. T. observations
 3. R. B. observations



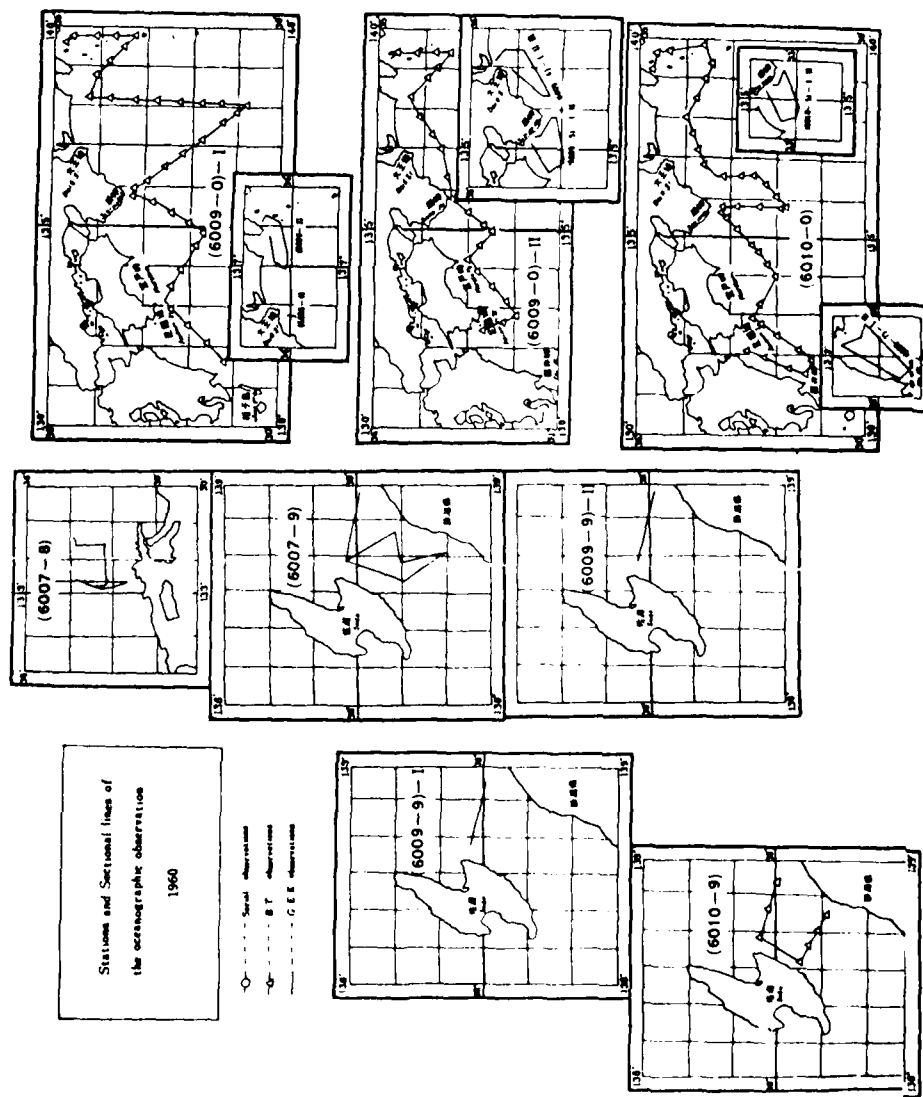
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1960



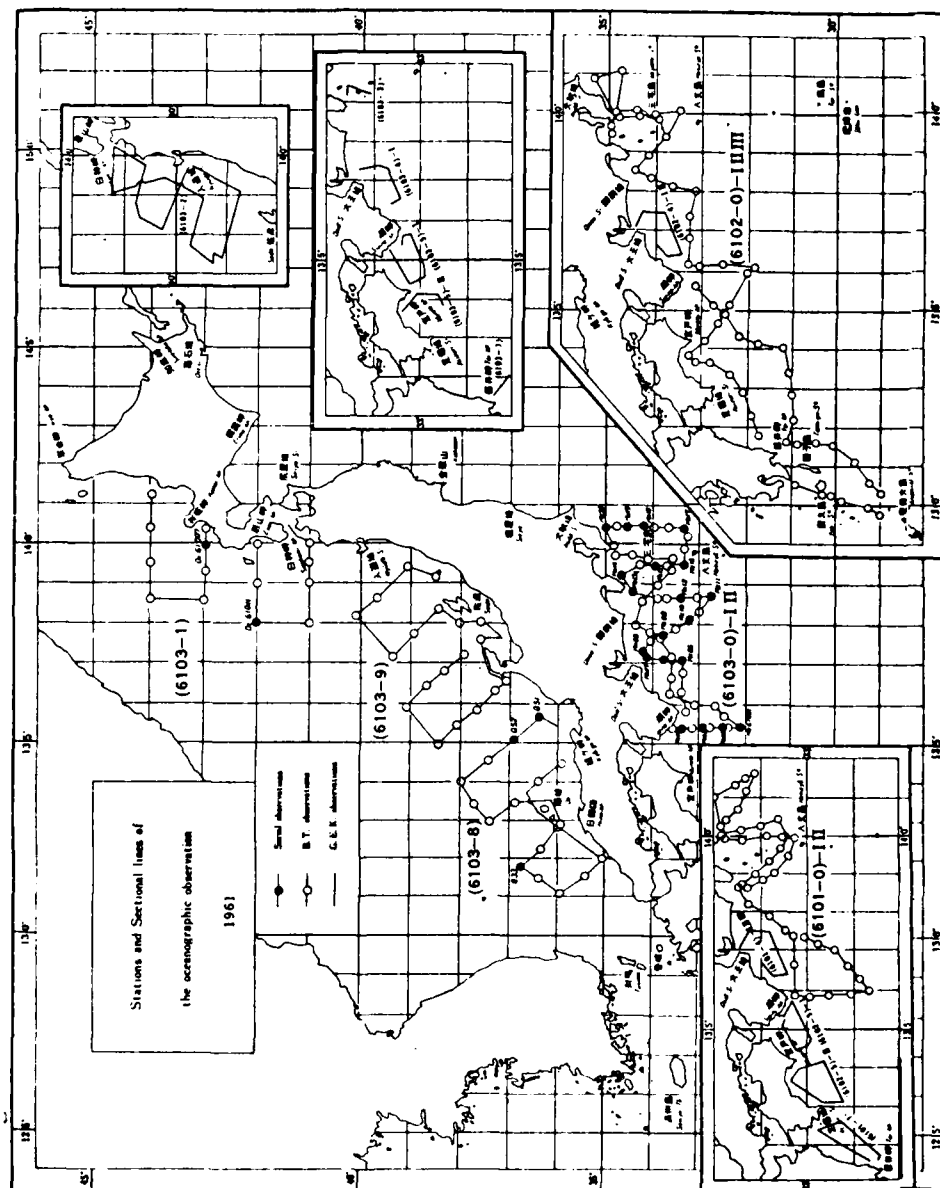
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1960



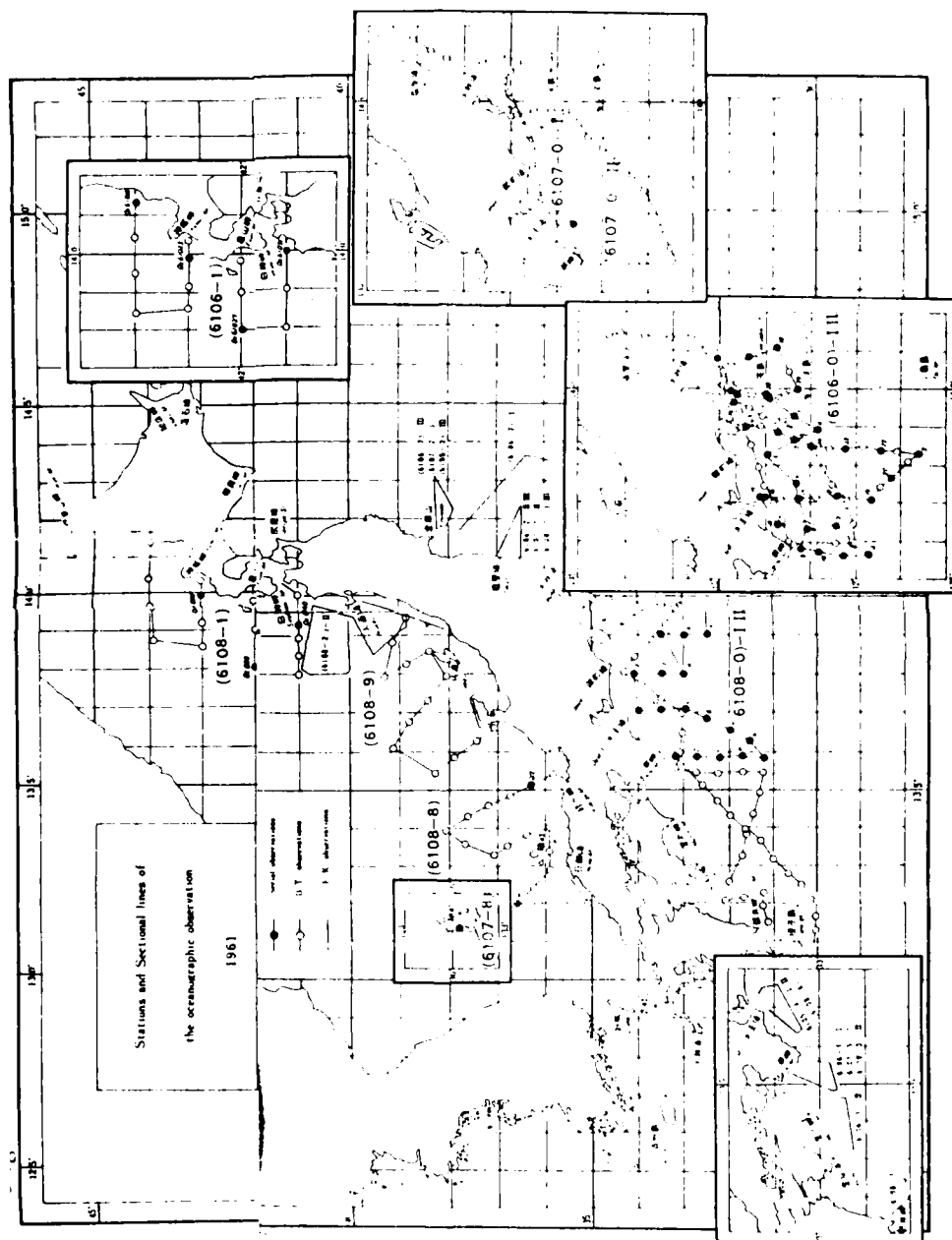
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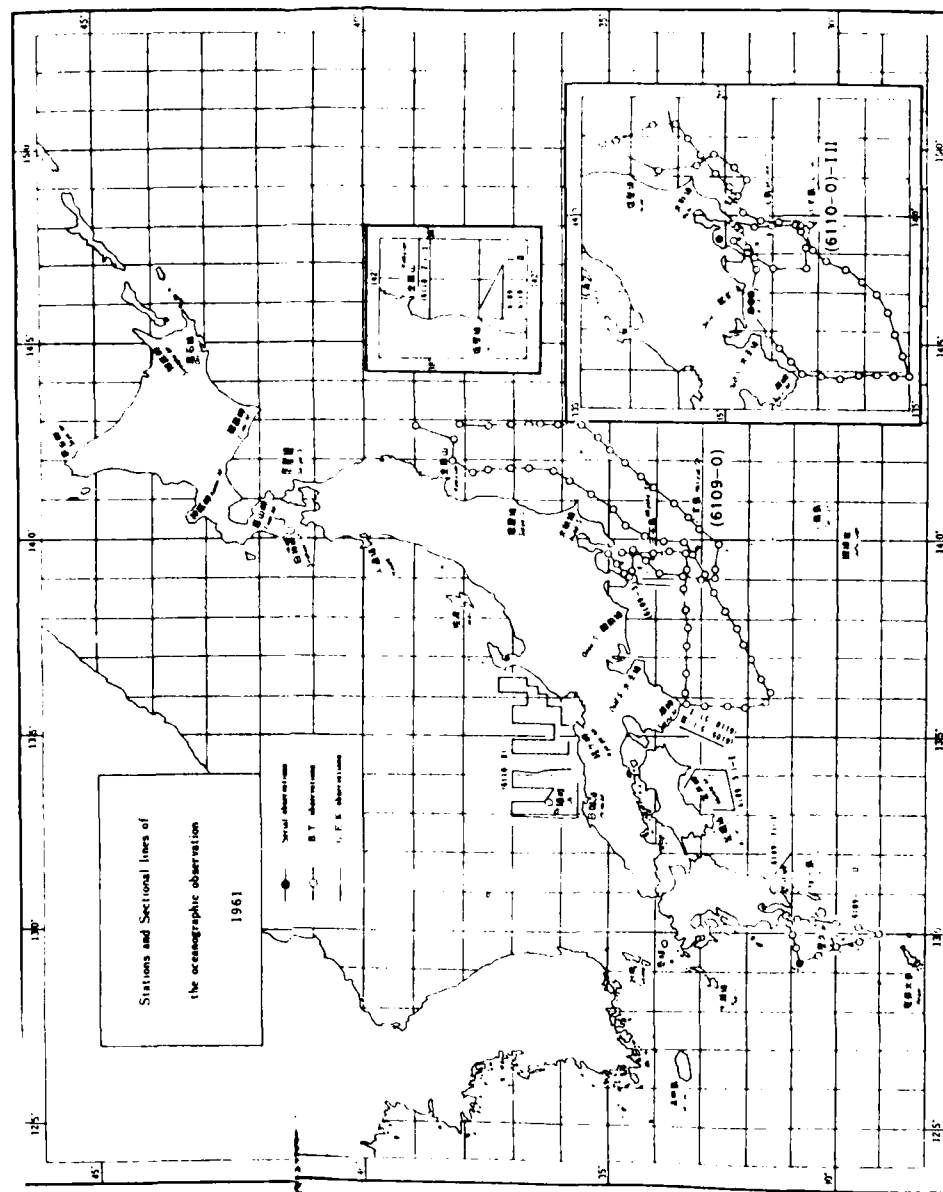
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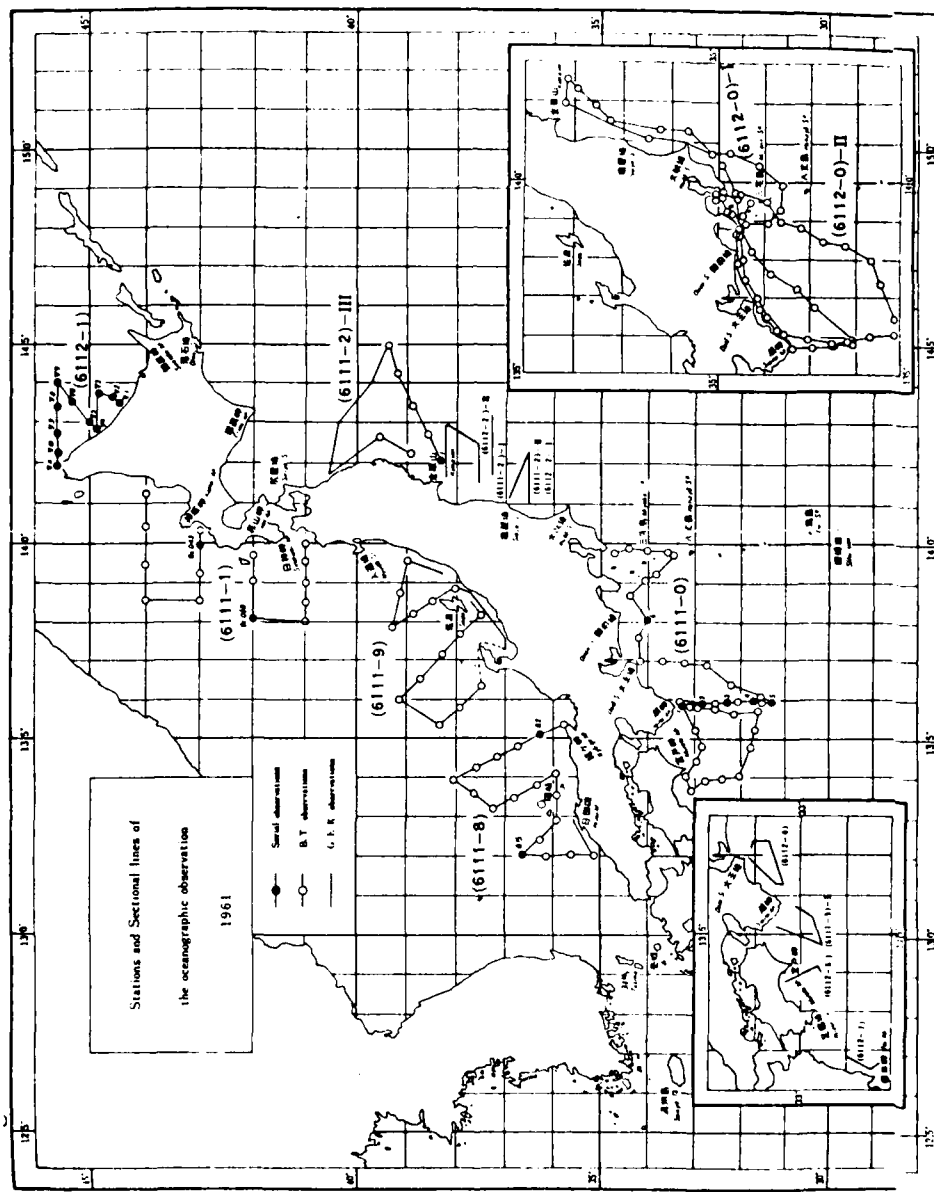
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1961



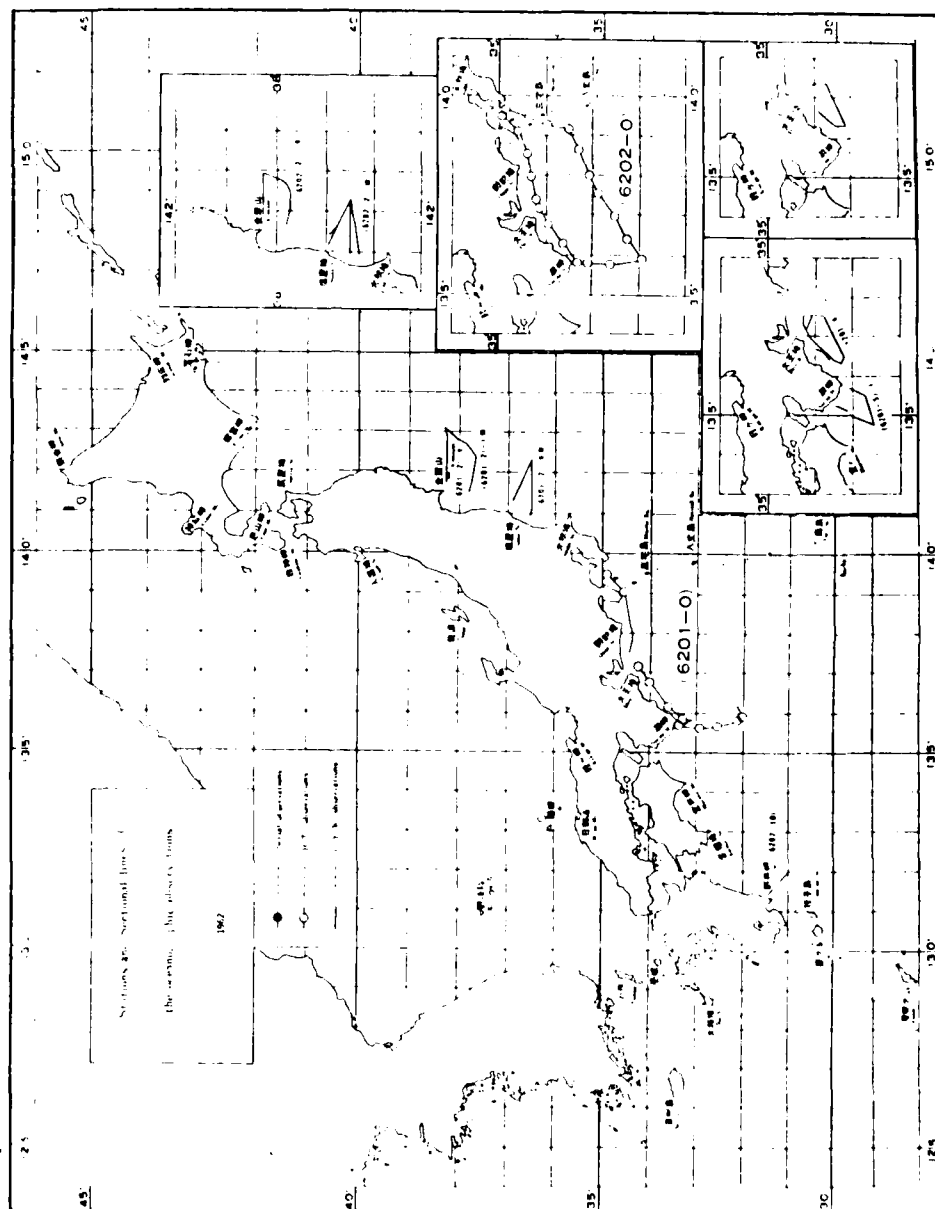
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1961



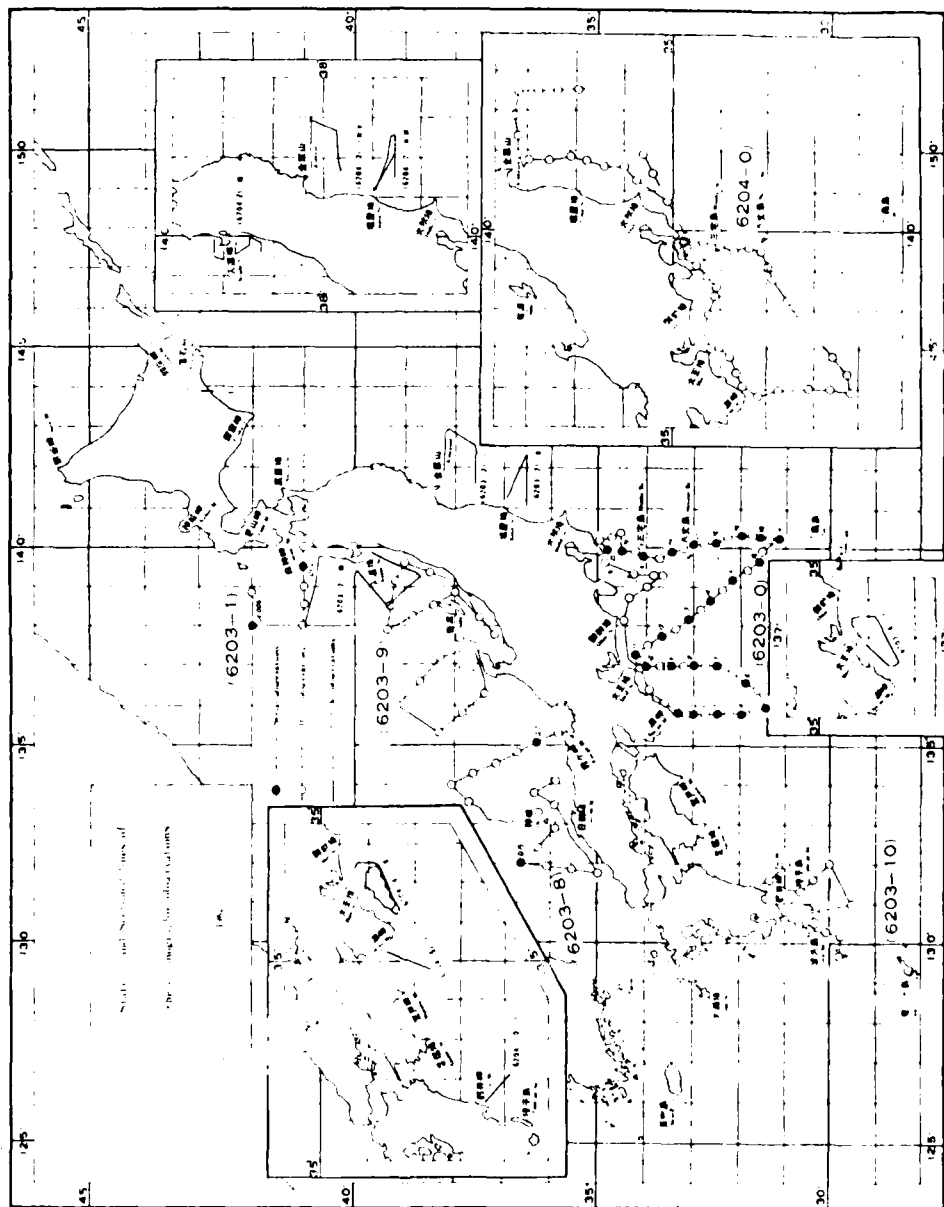
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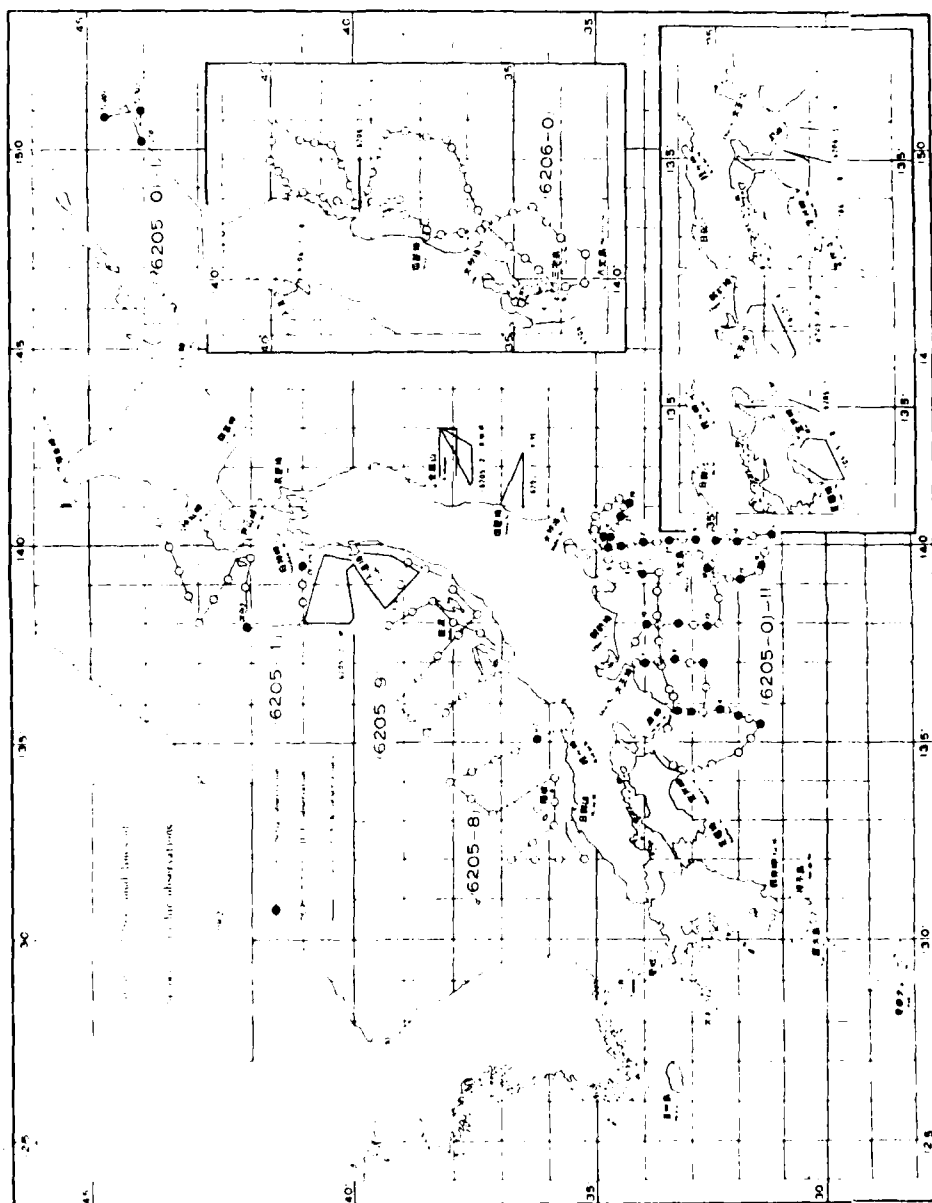
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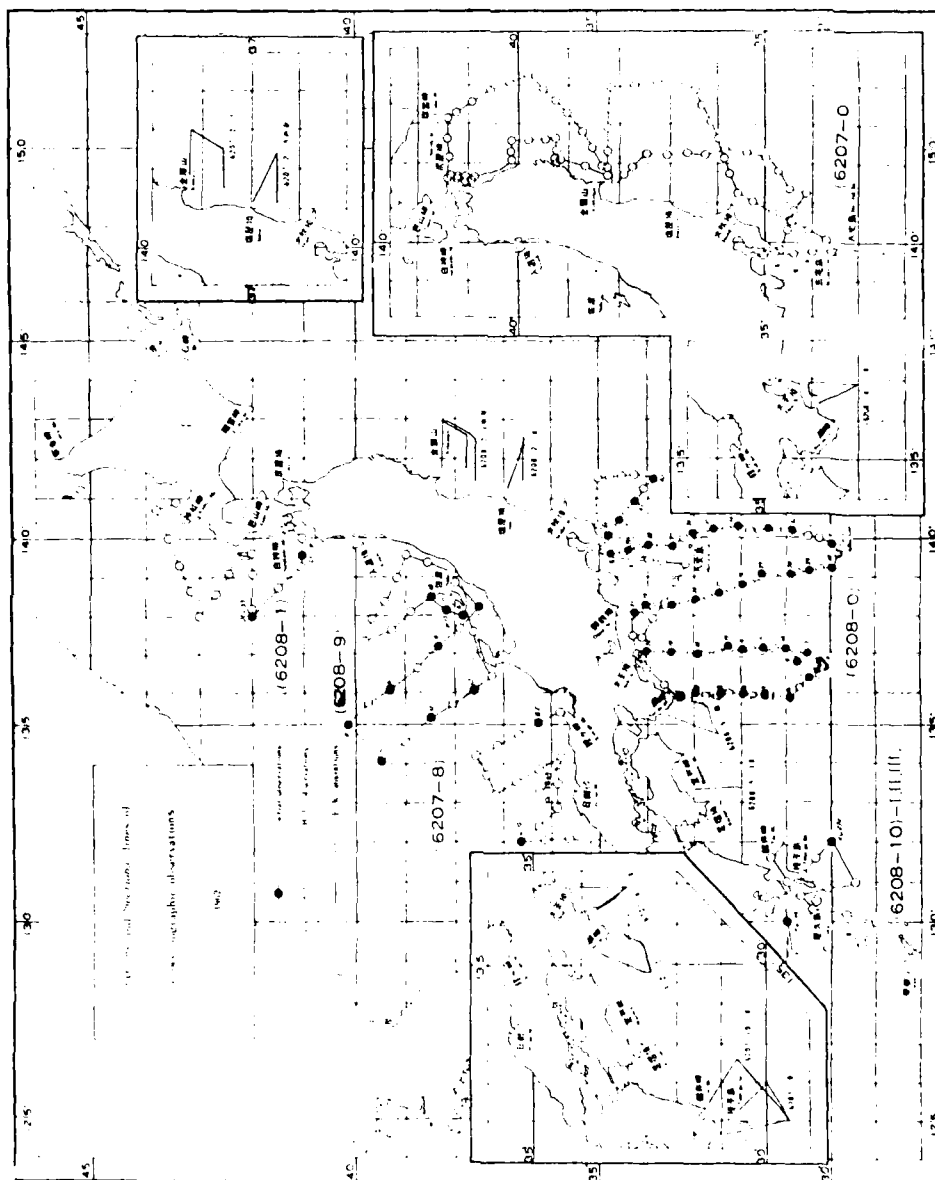
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1962



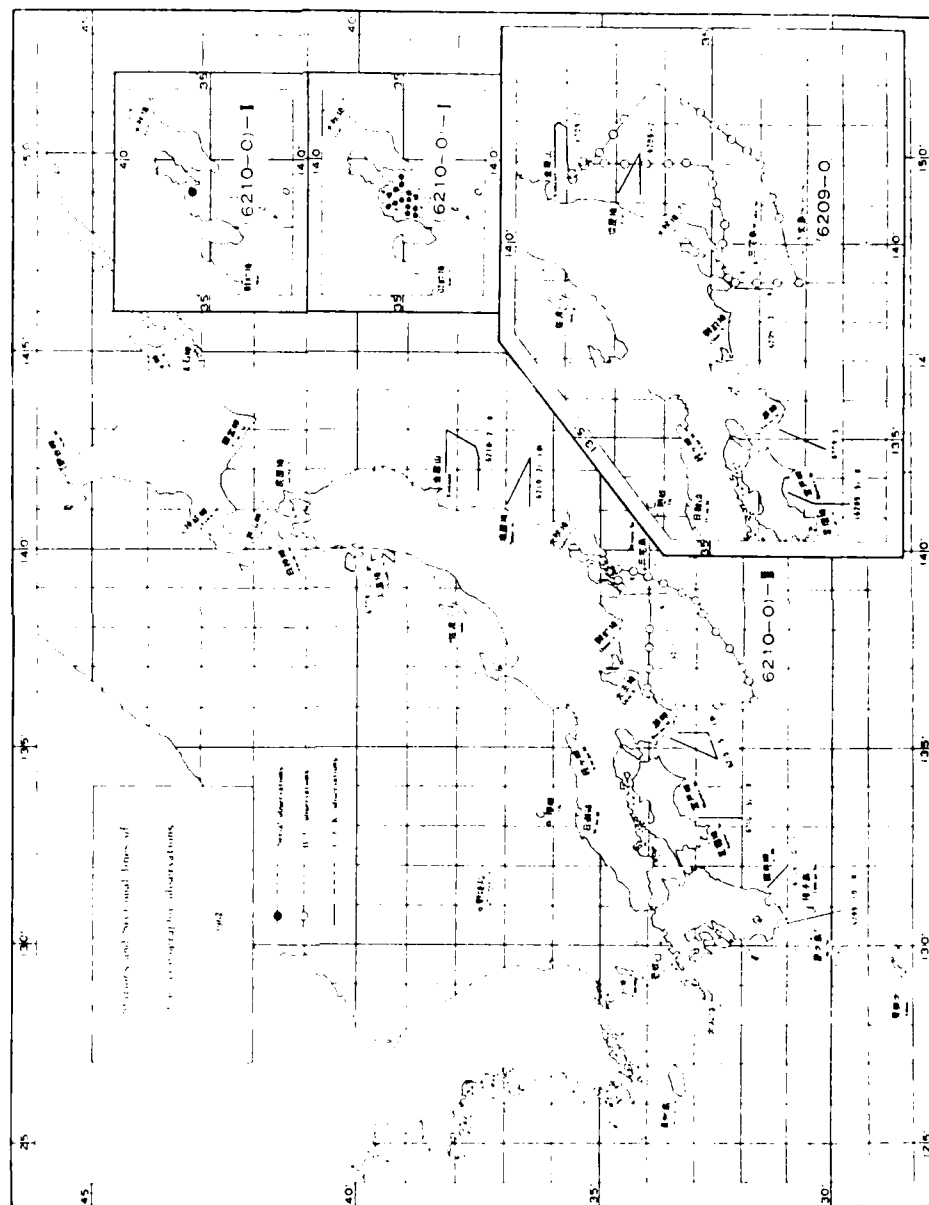
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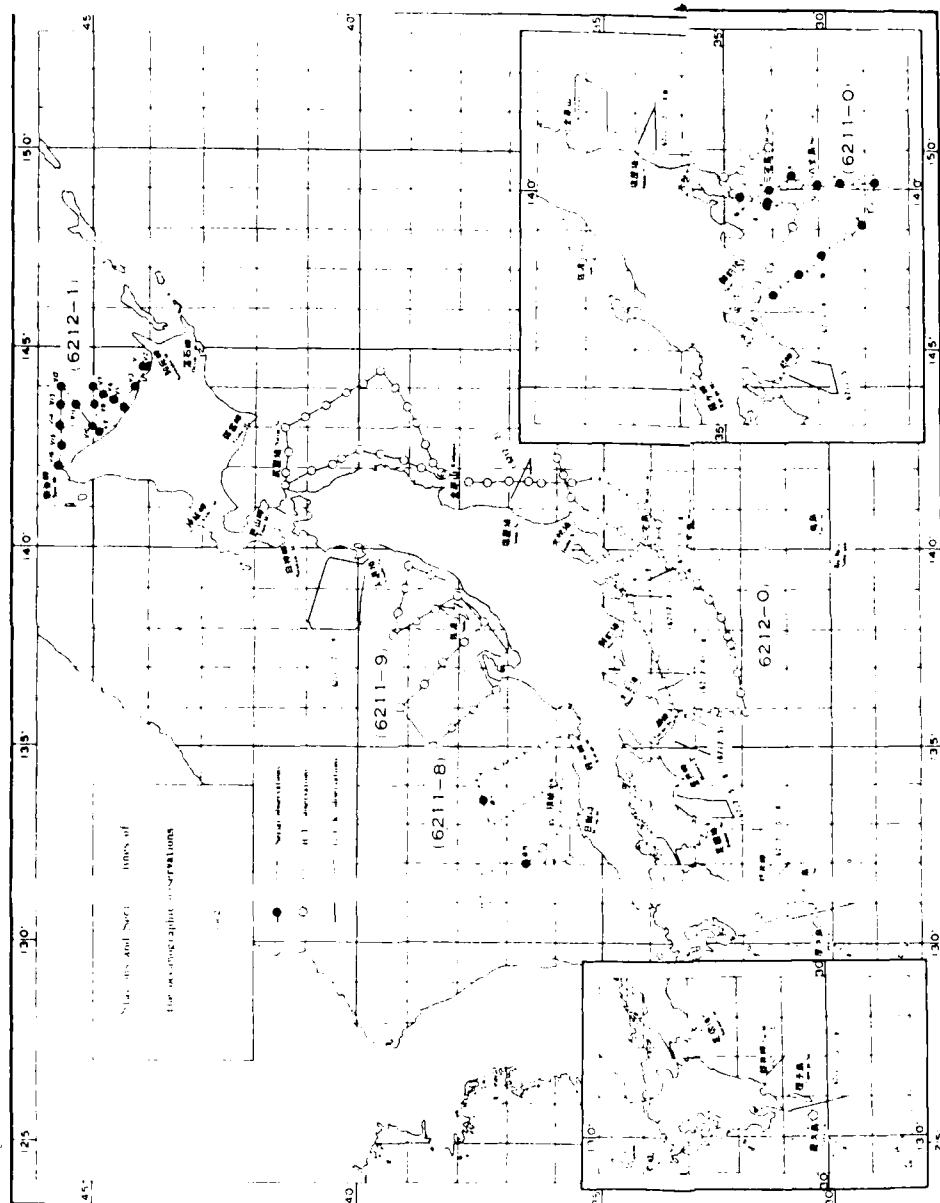
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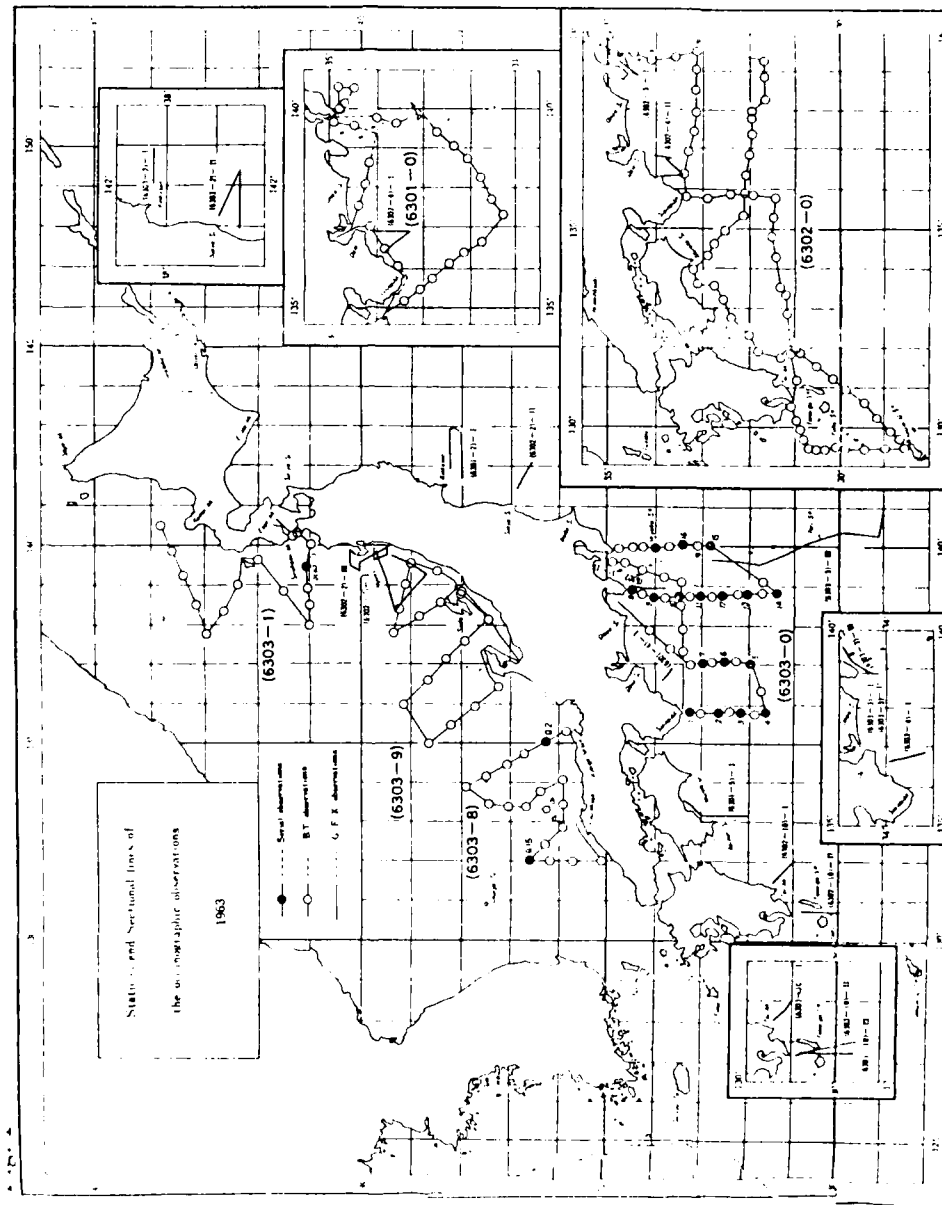
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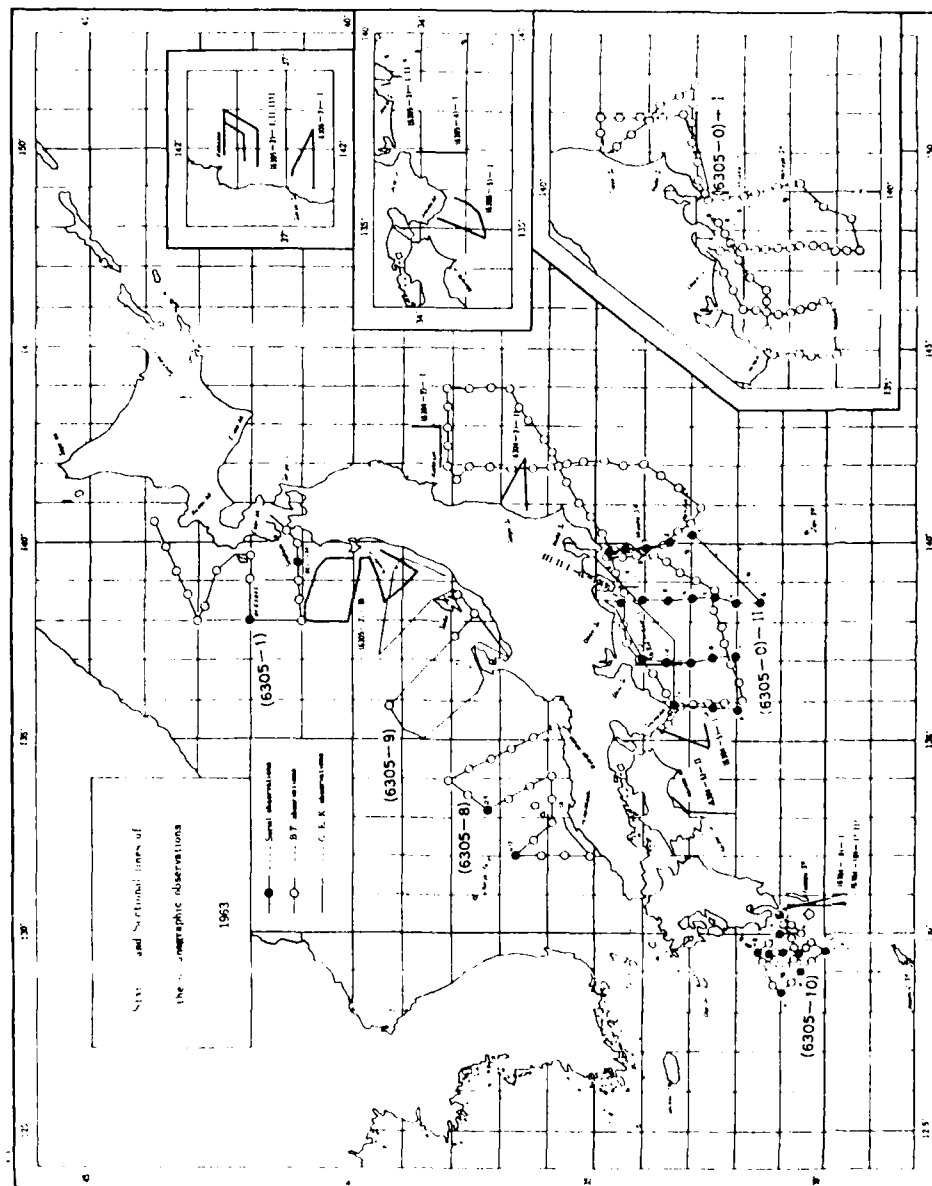
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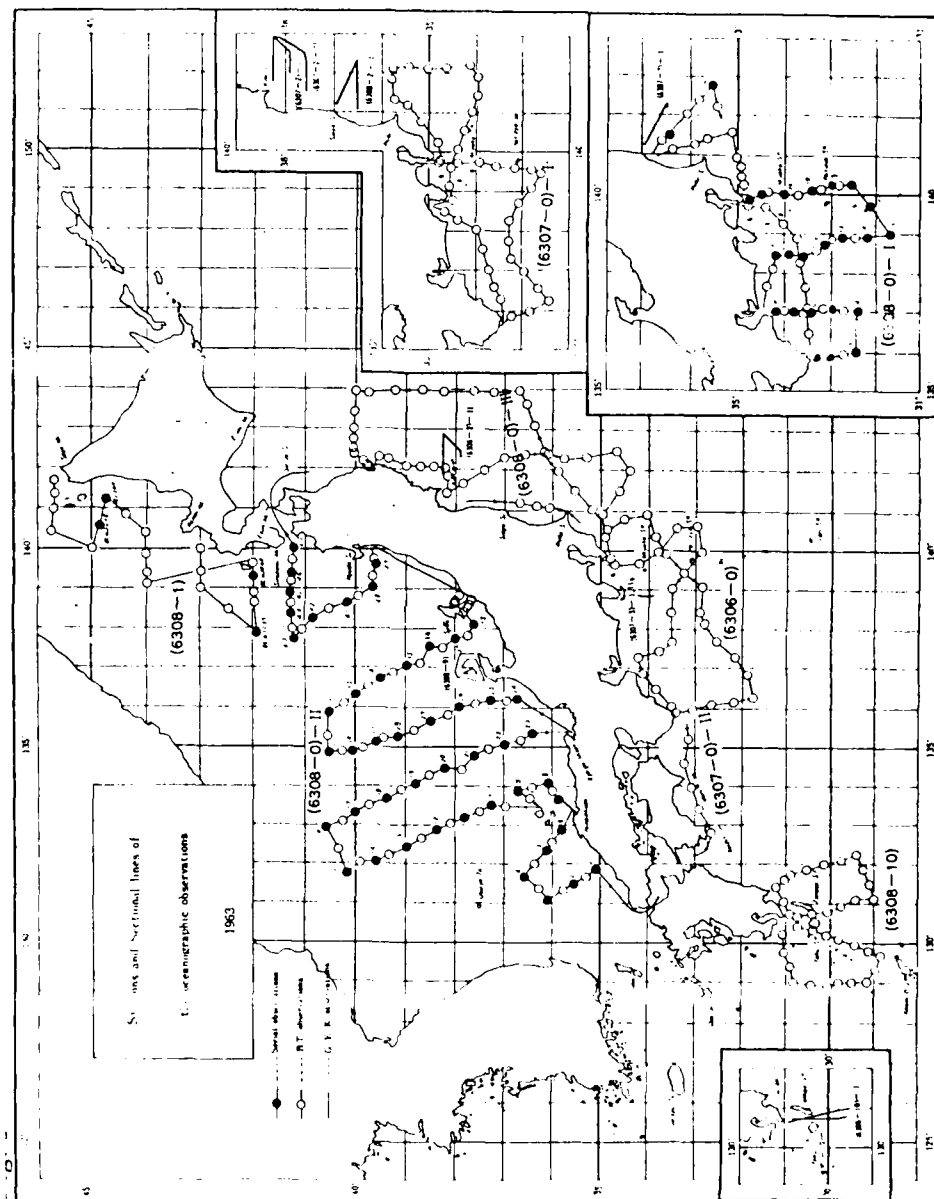
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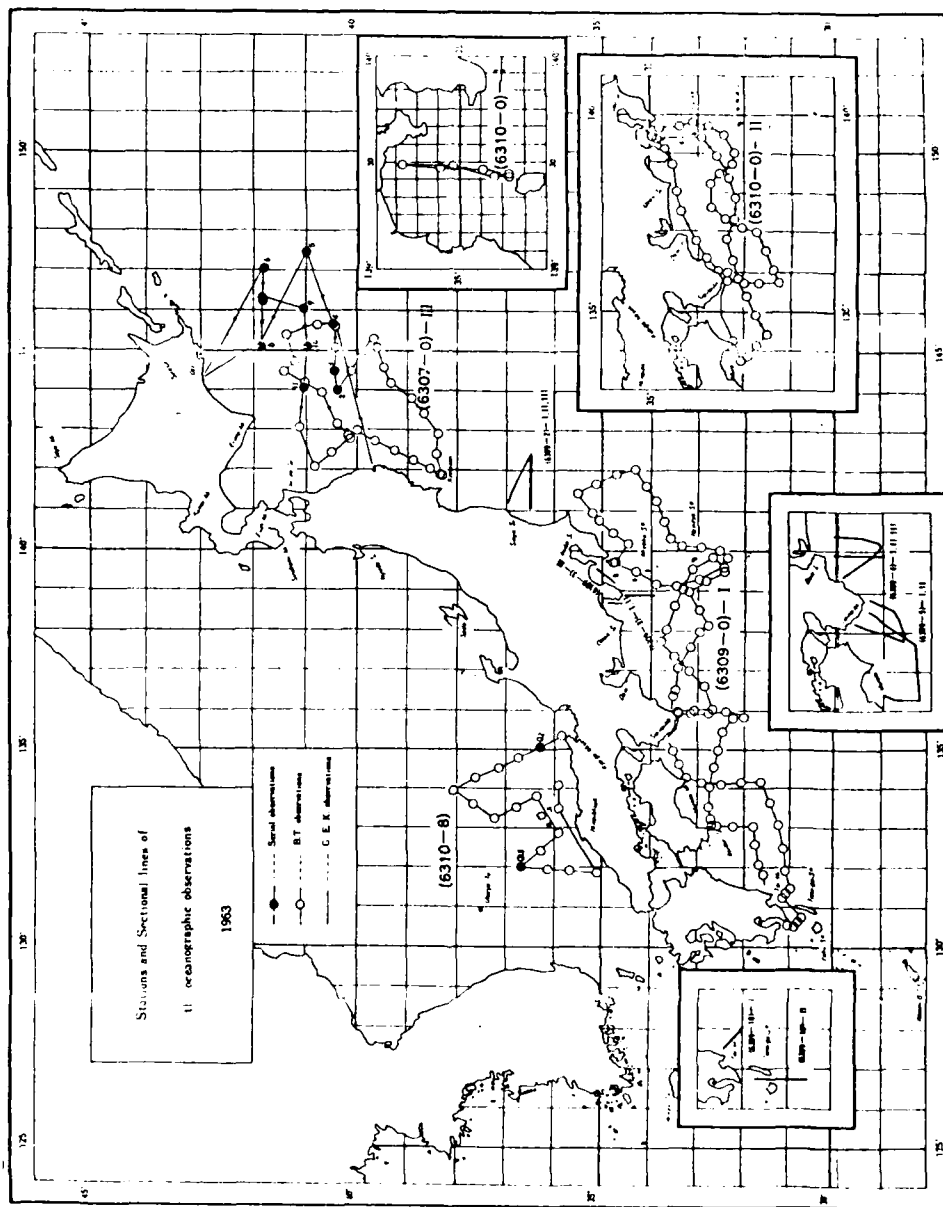
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1963



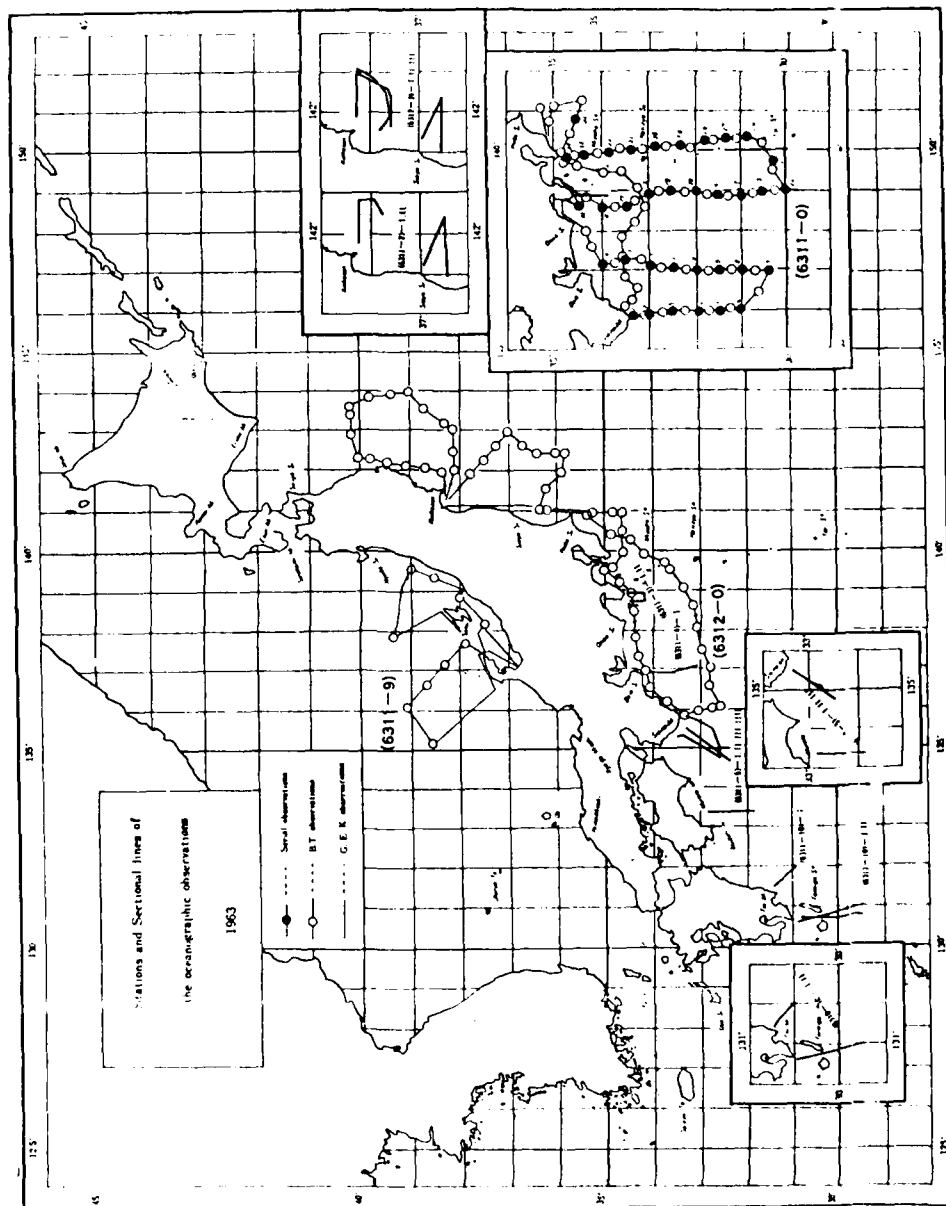
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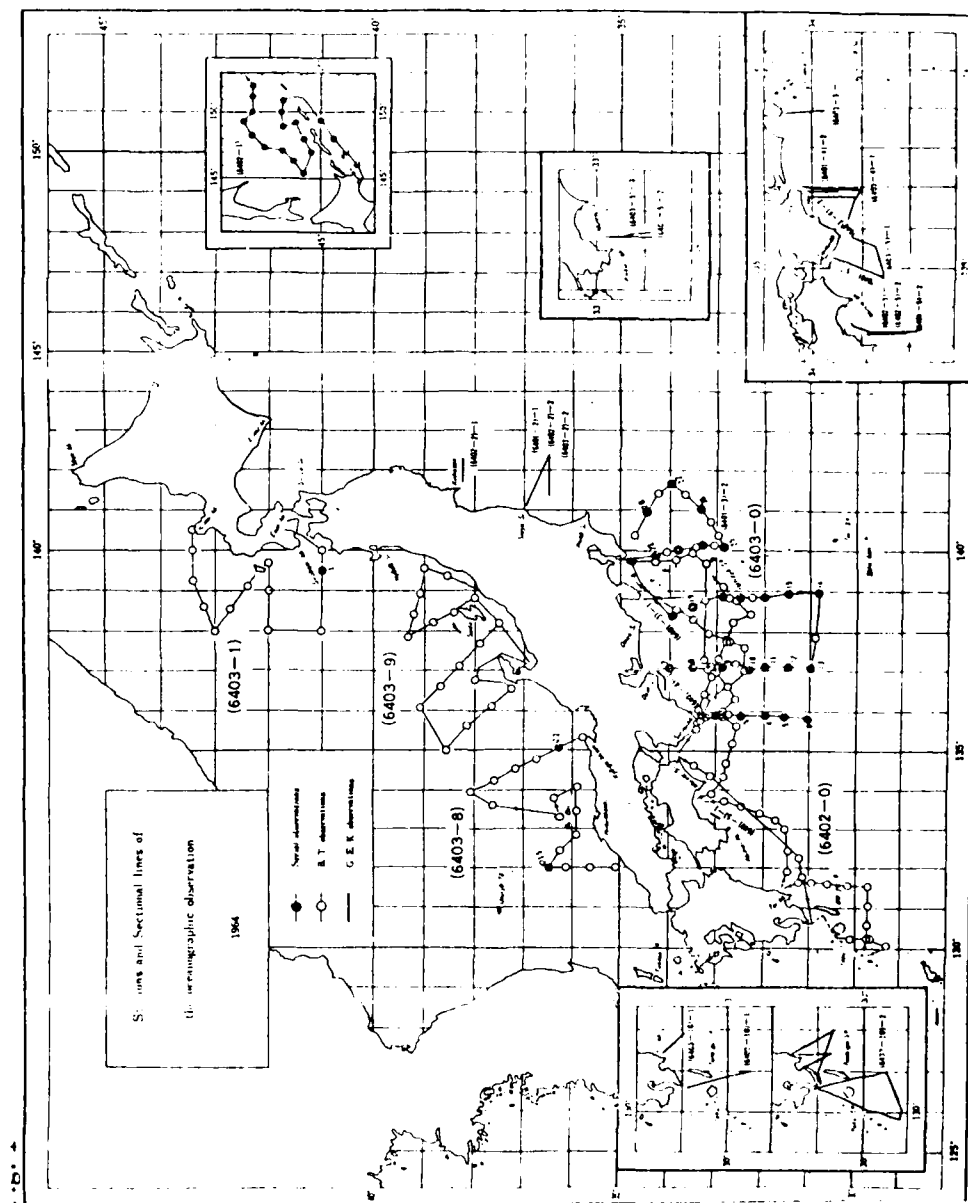
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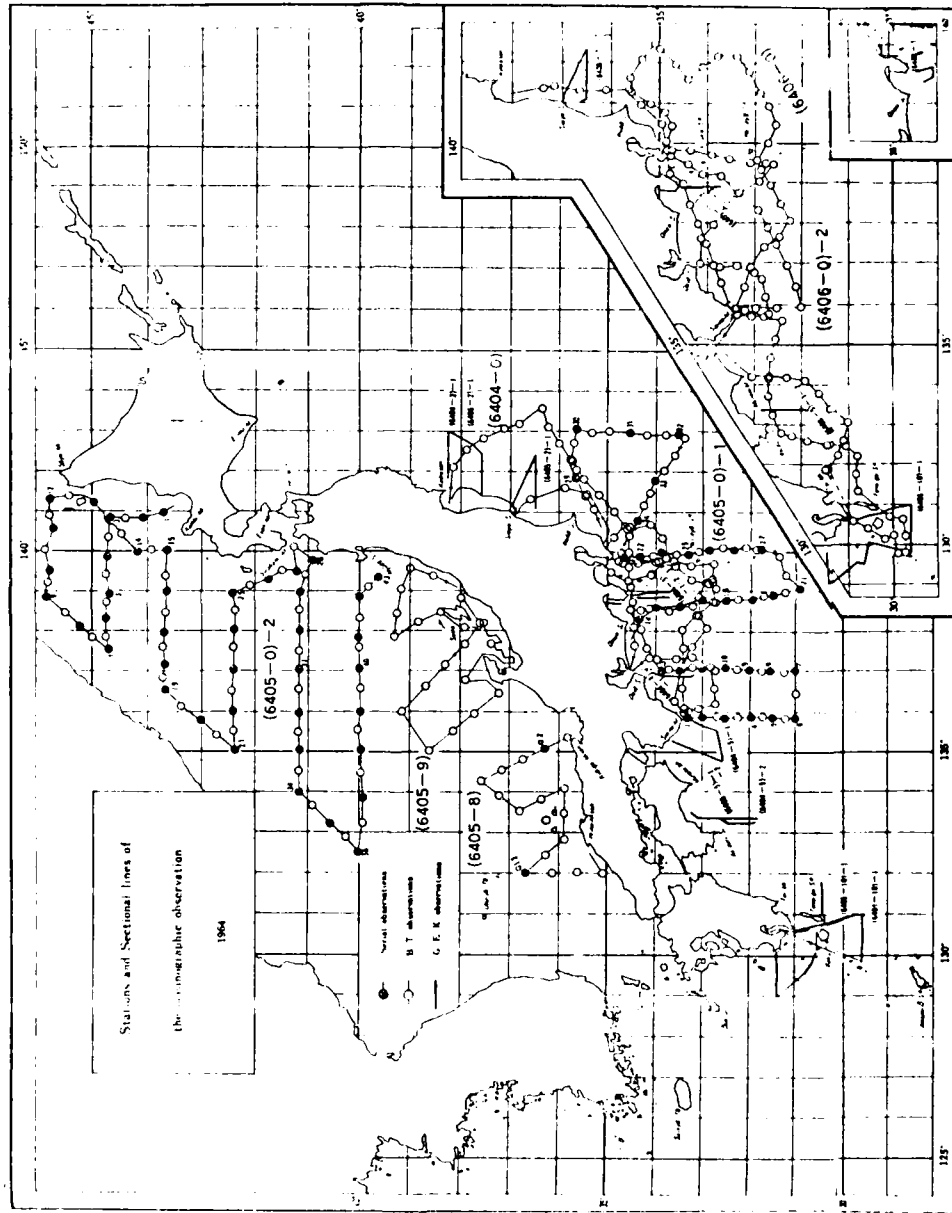
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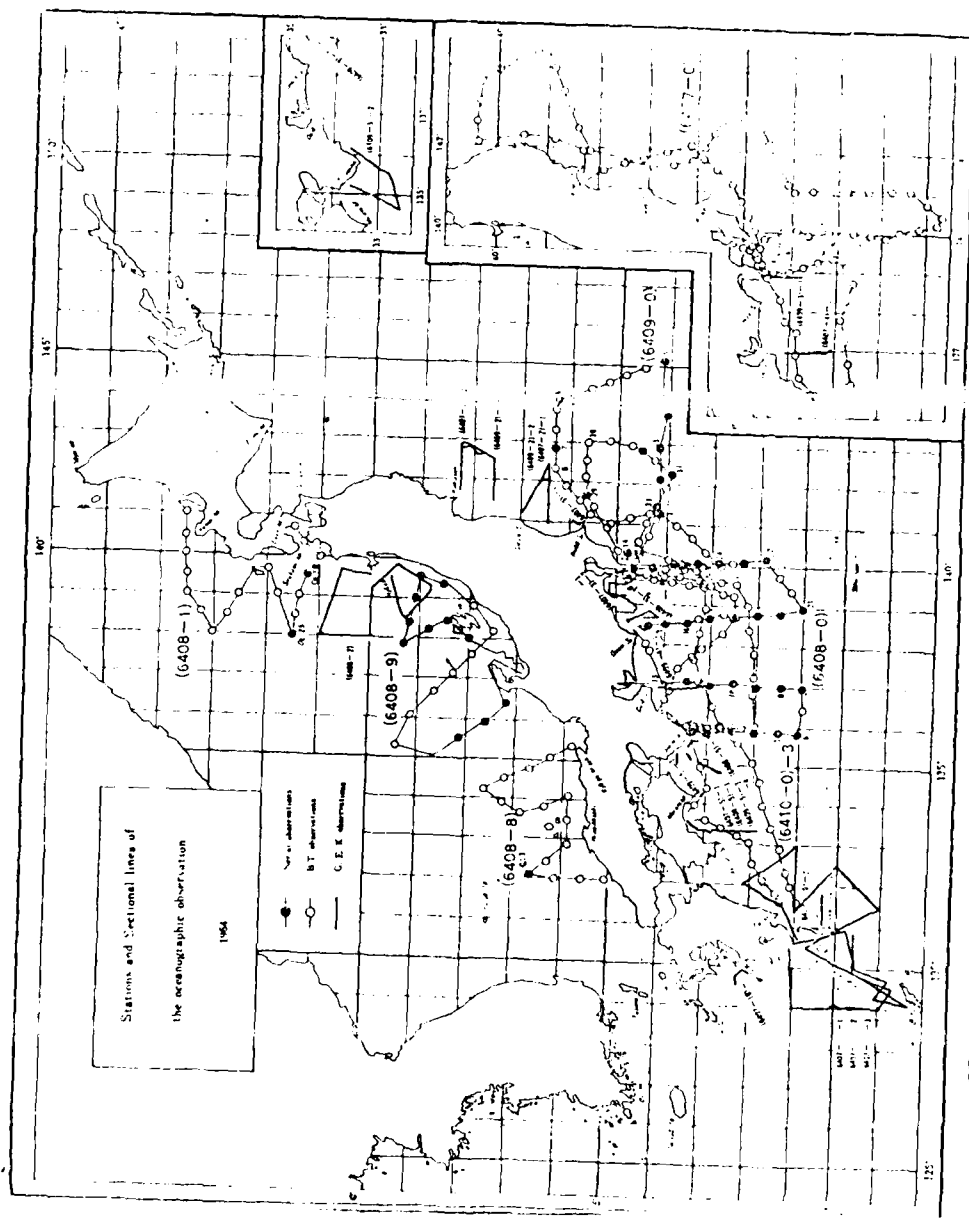
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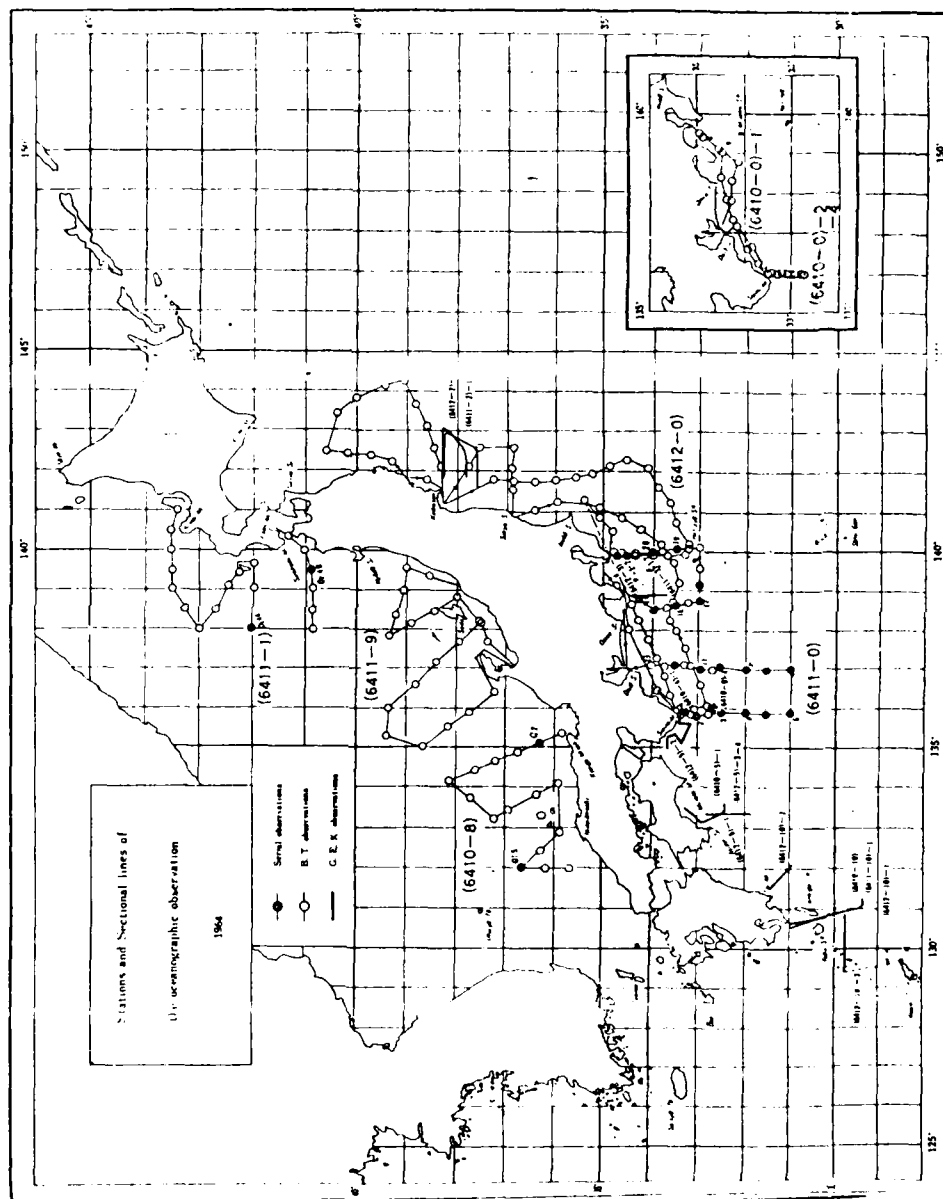
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1964

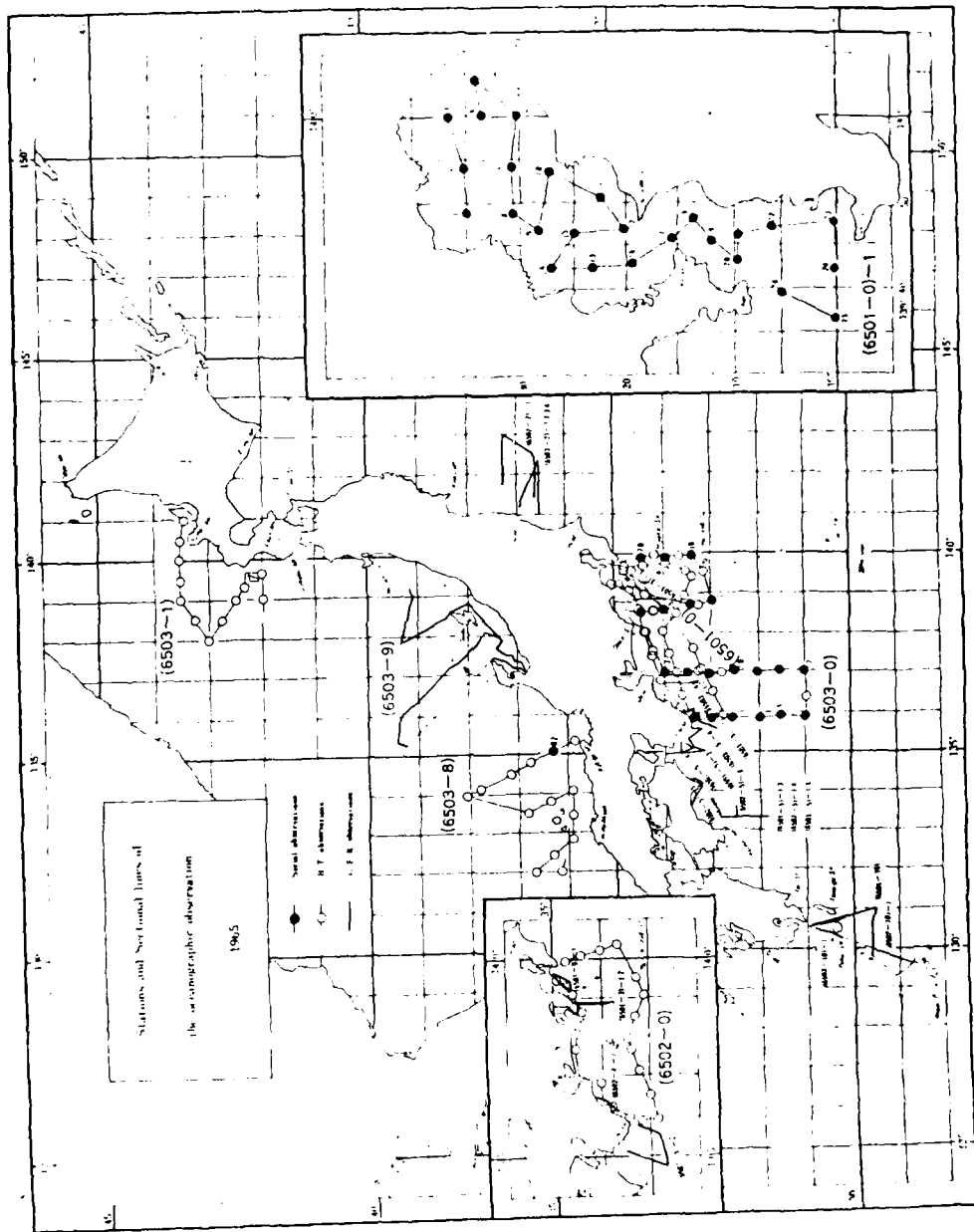


CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1964

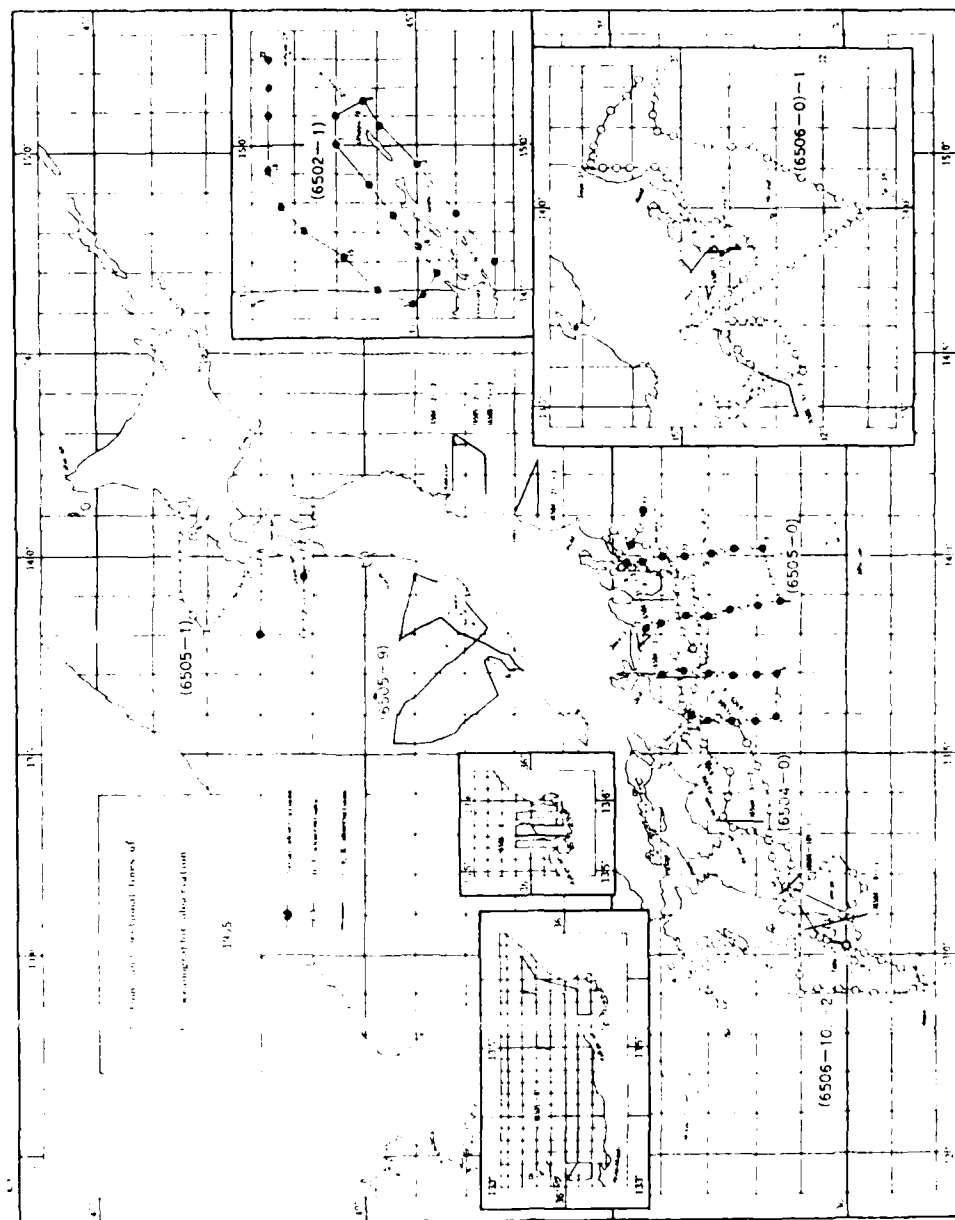


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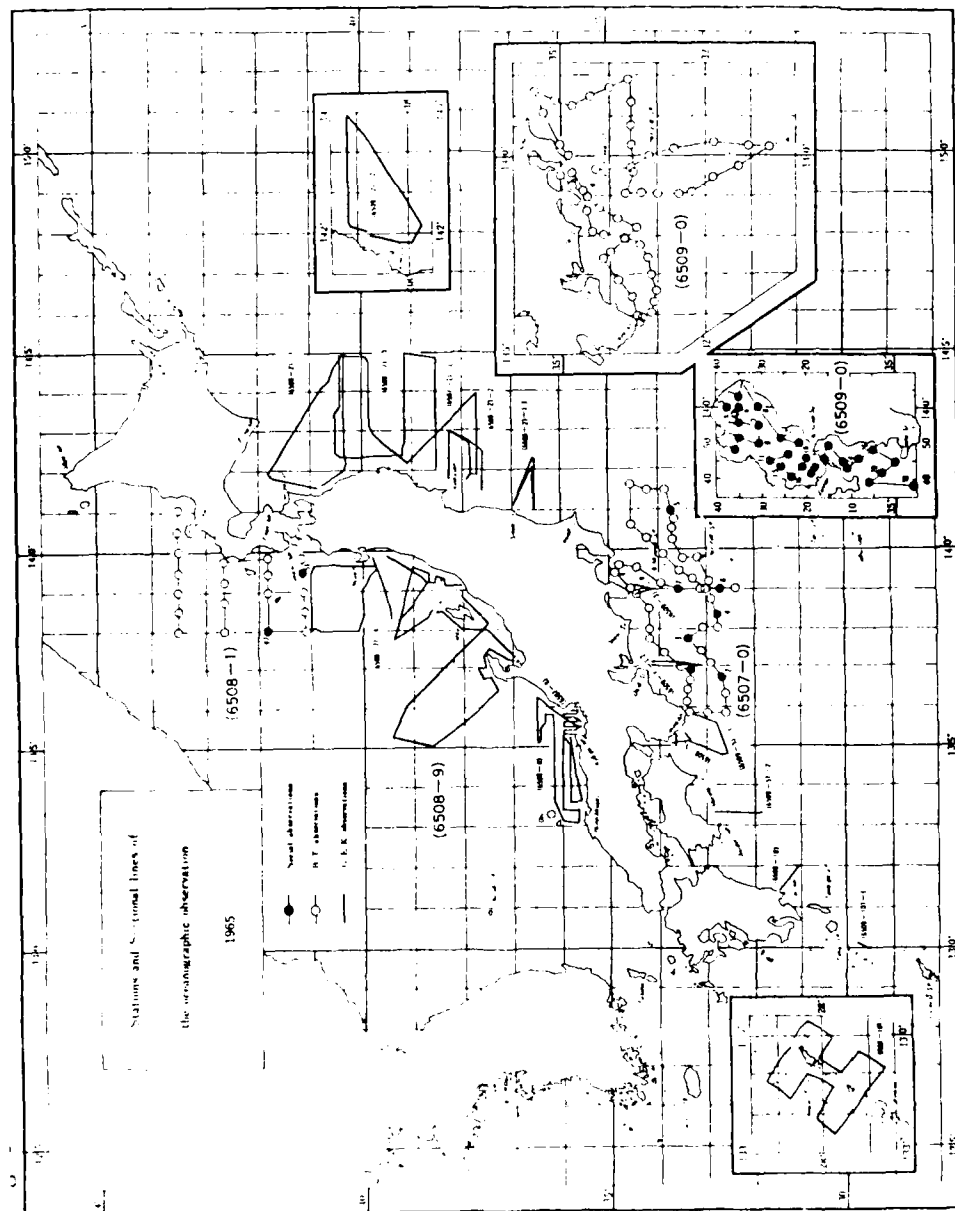




CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1965



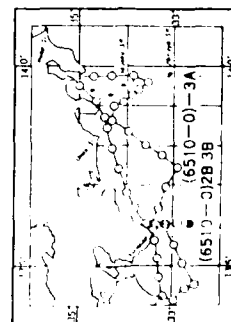
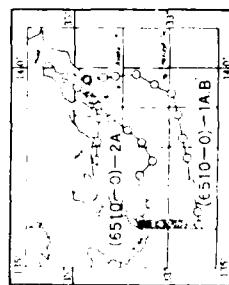
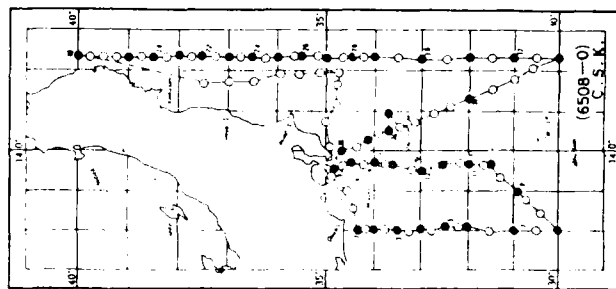
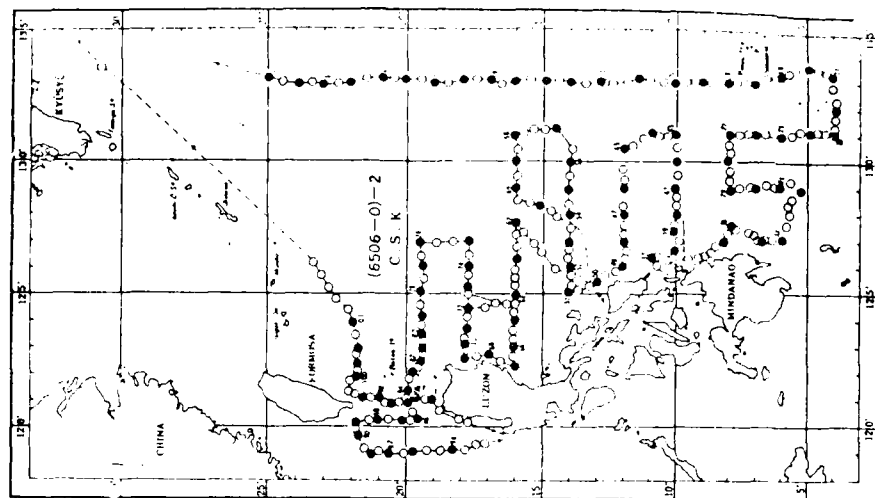
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1965



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1965



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1965



Sections and vertical lines of
the oceanographic observation
1965

● Total observation
○ B.T. observation
— C.S.K. observation

CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1965

AD-A110 915

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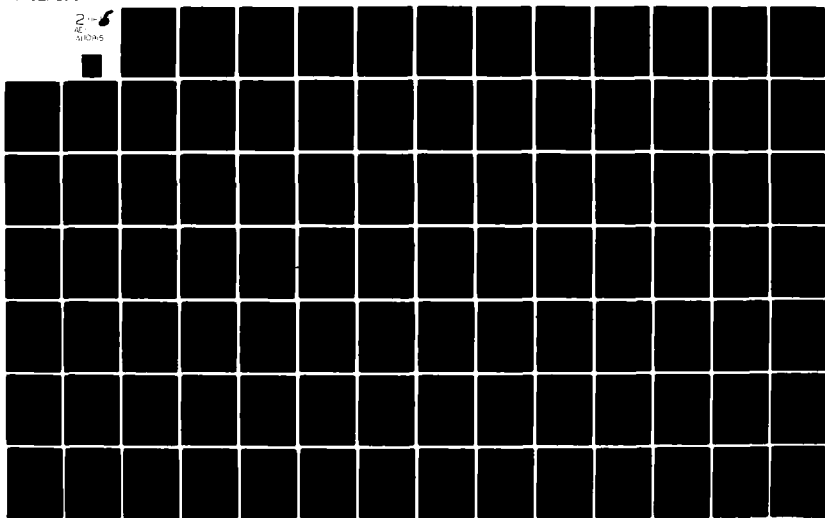
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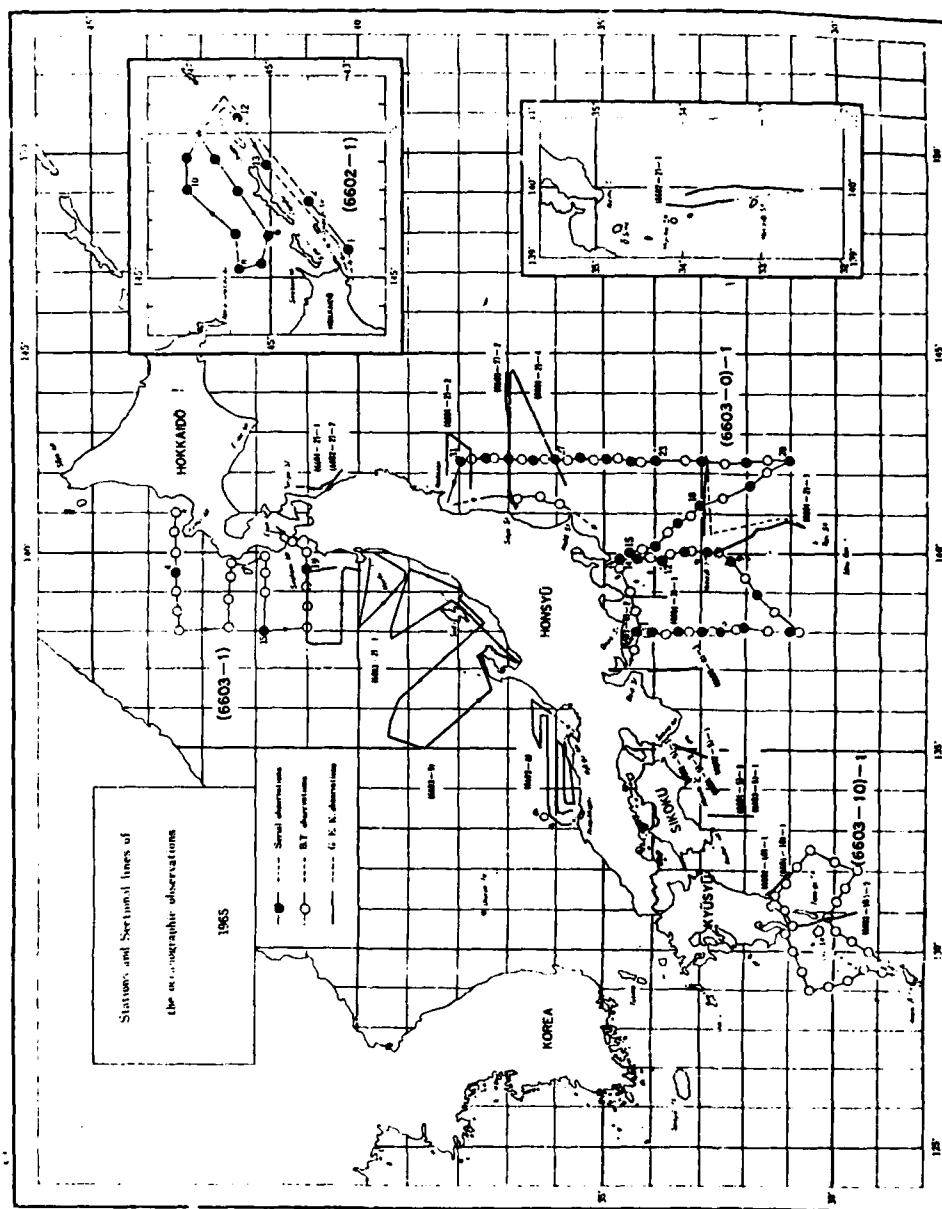
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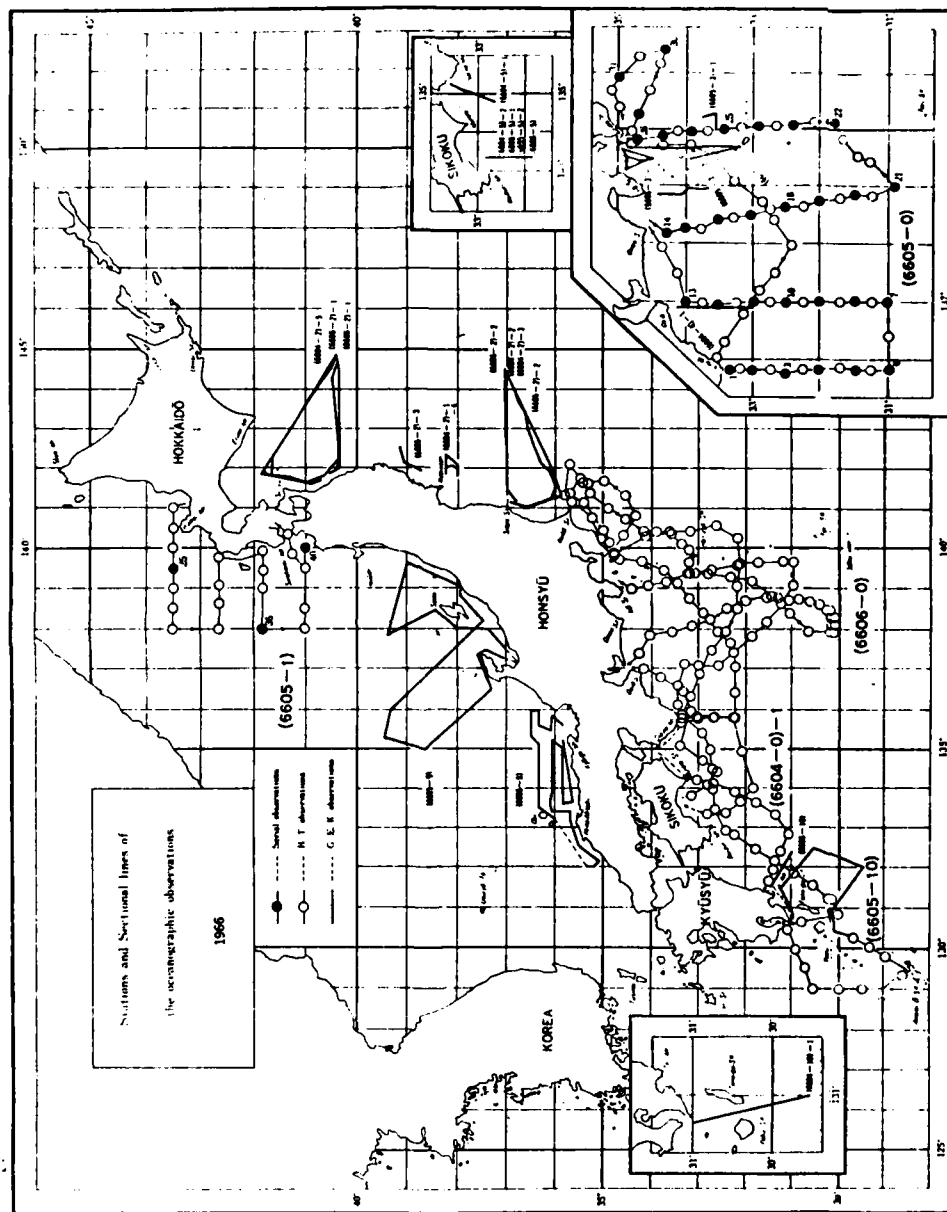
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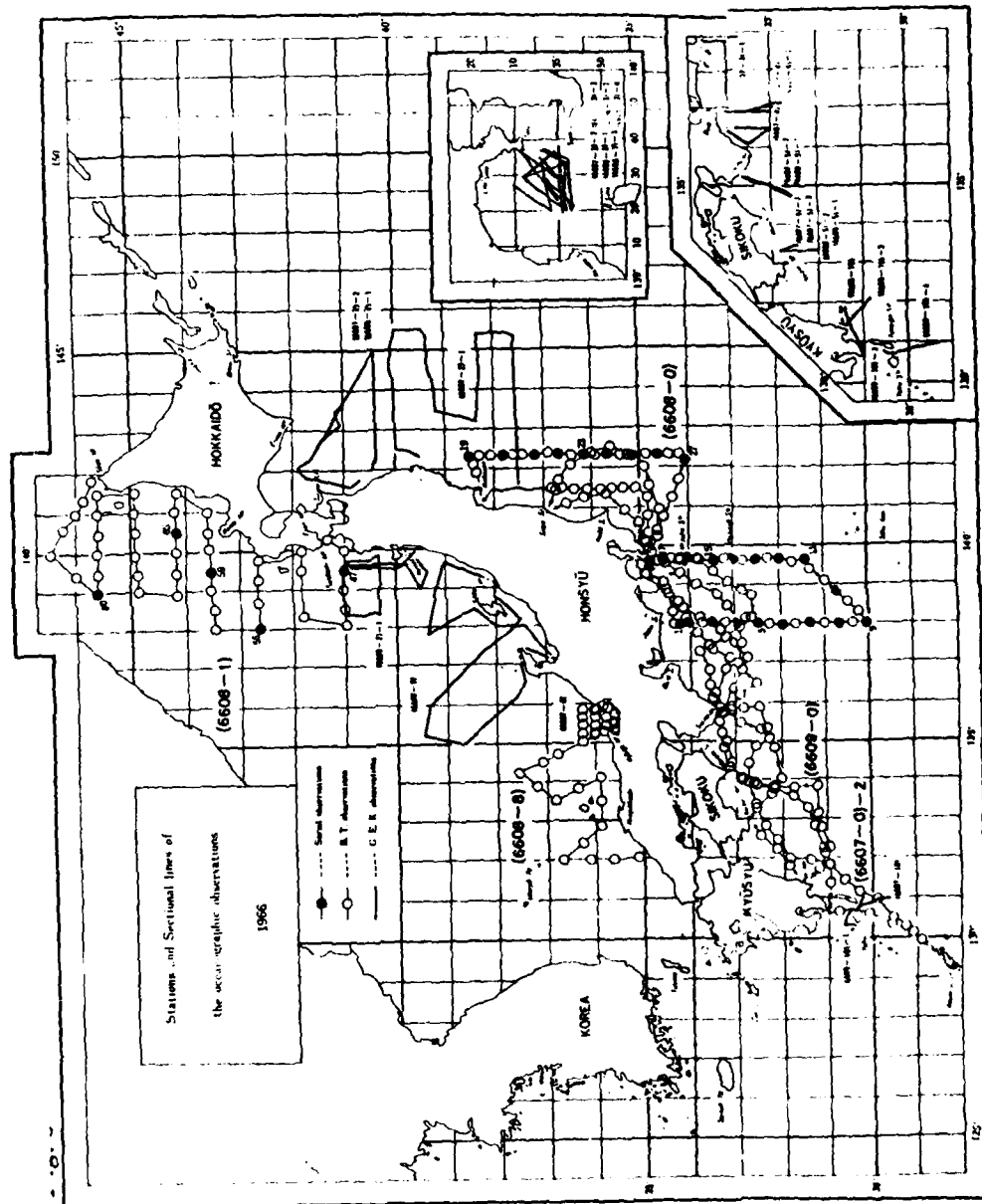




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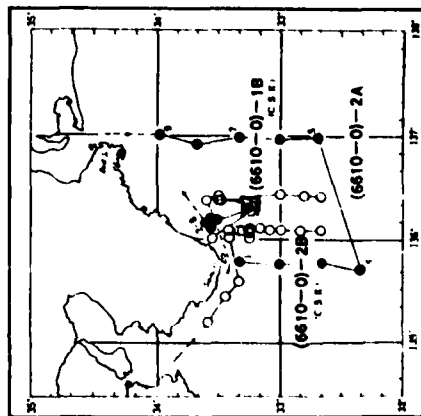
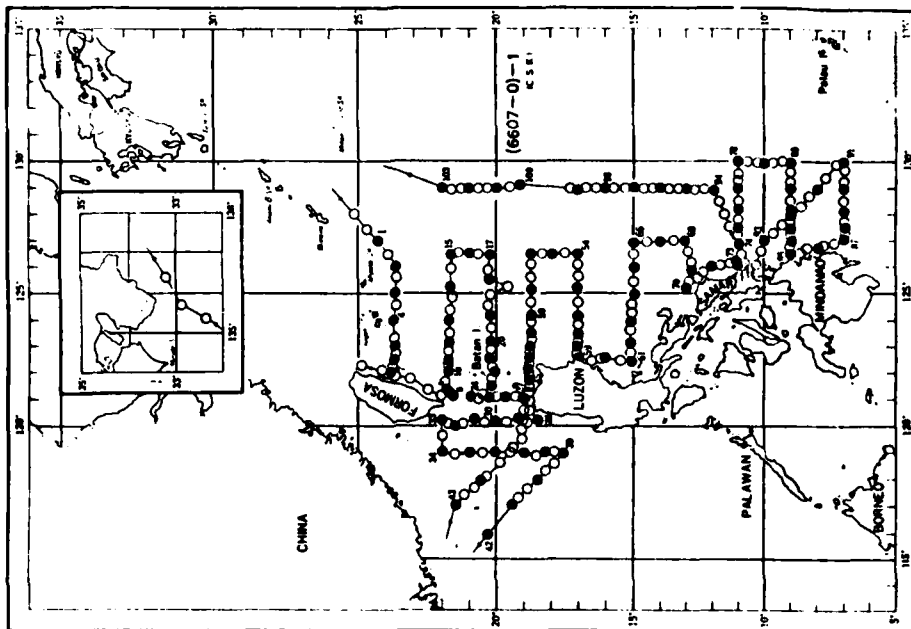
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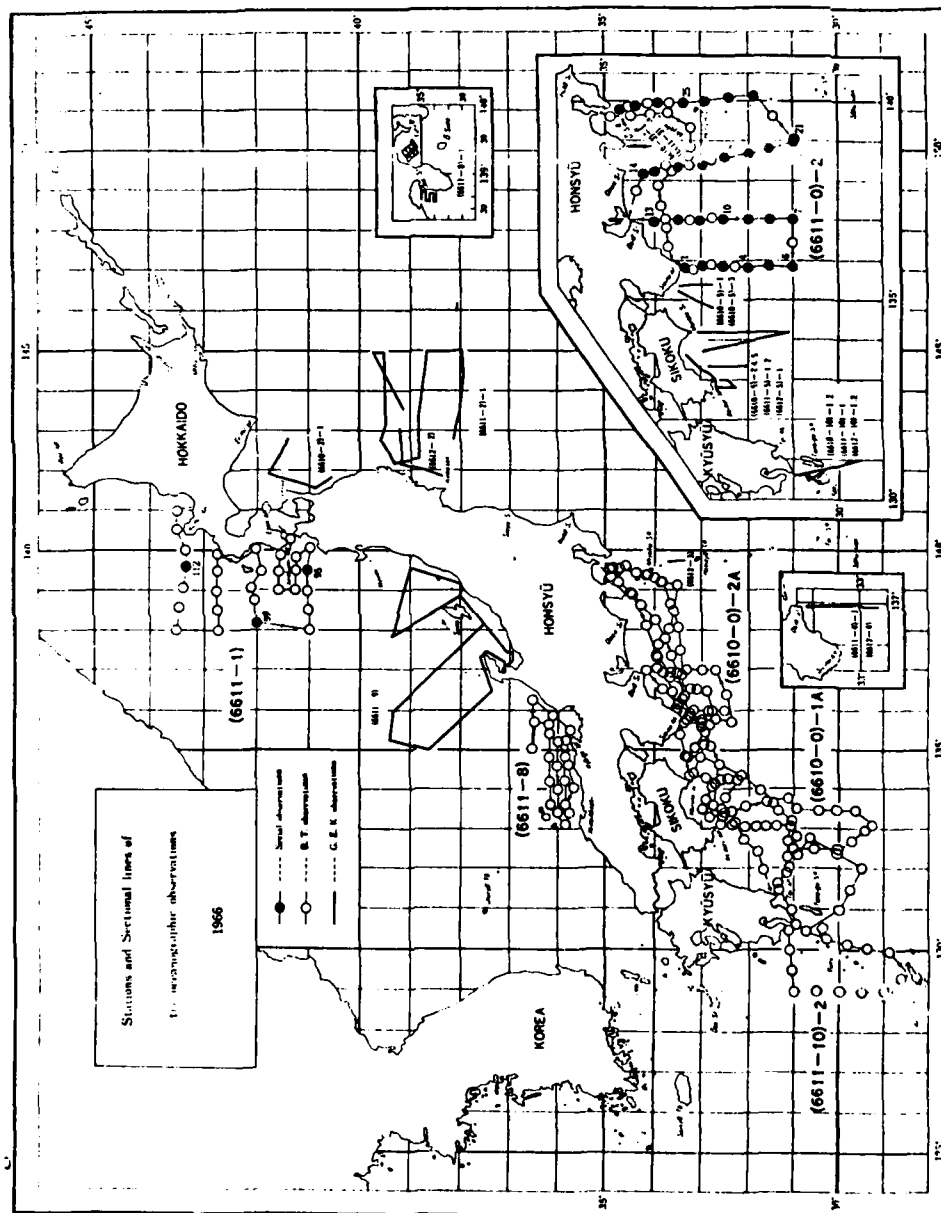
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Star and Section lines of
 the hydrographic observations
 1966

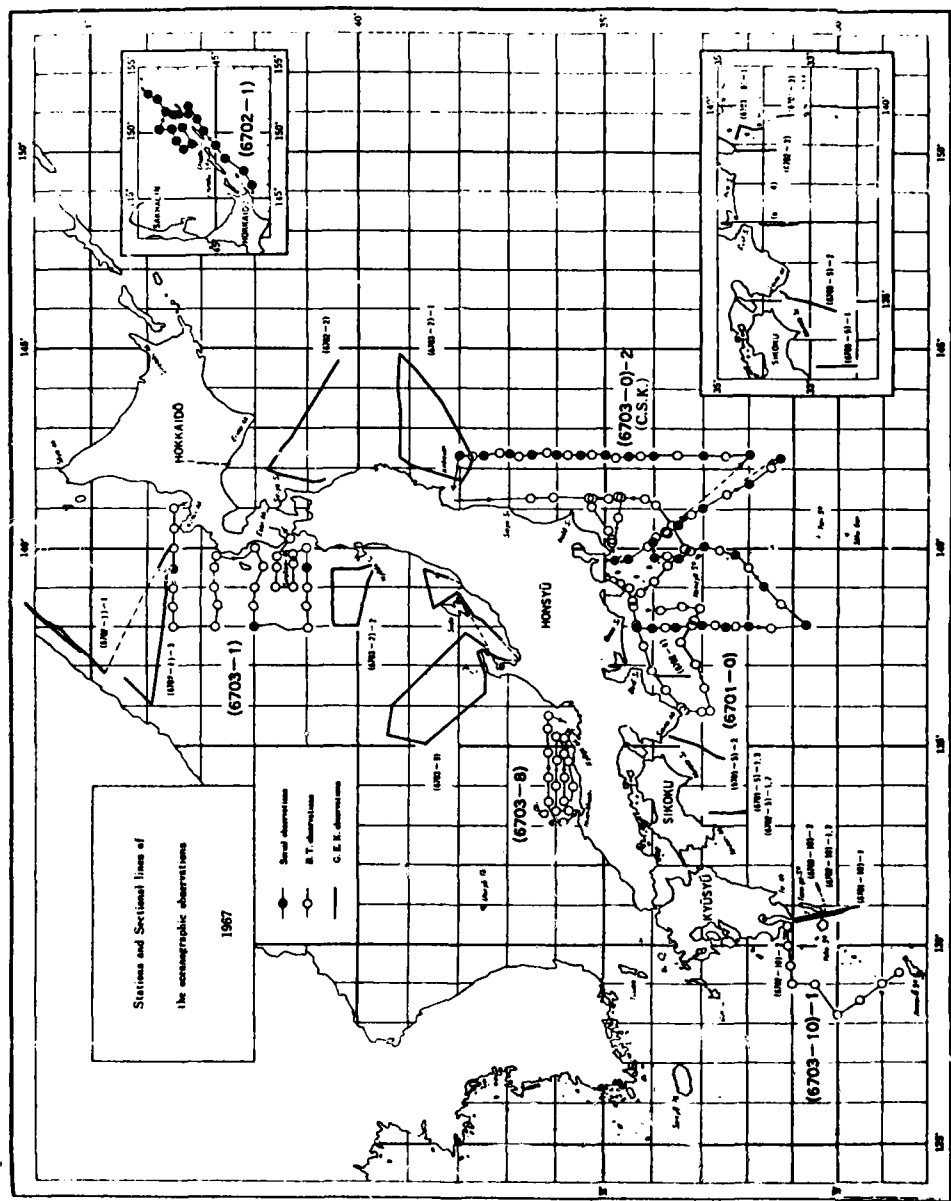
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 —○— N. I. observations
 — E. E. observations



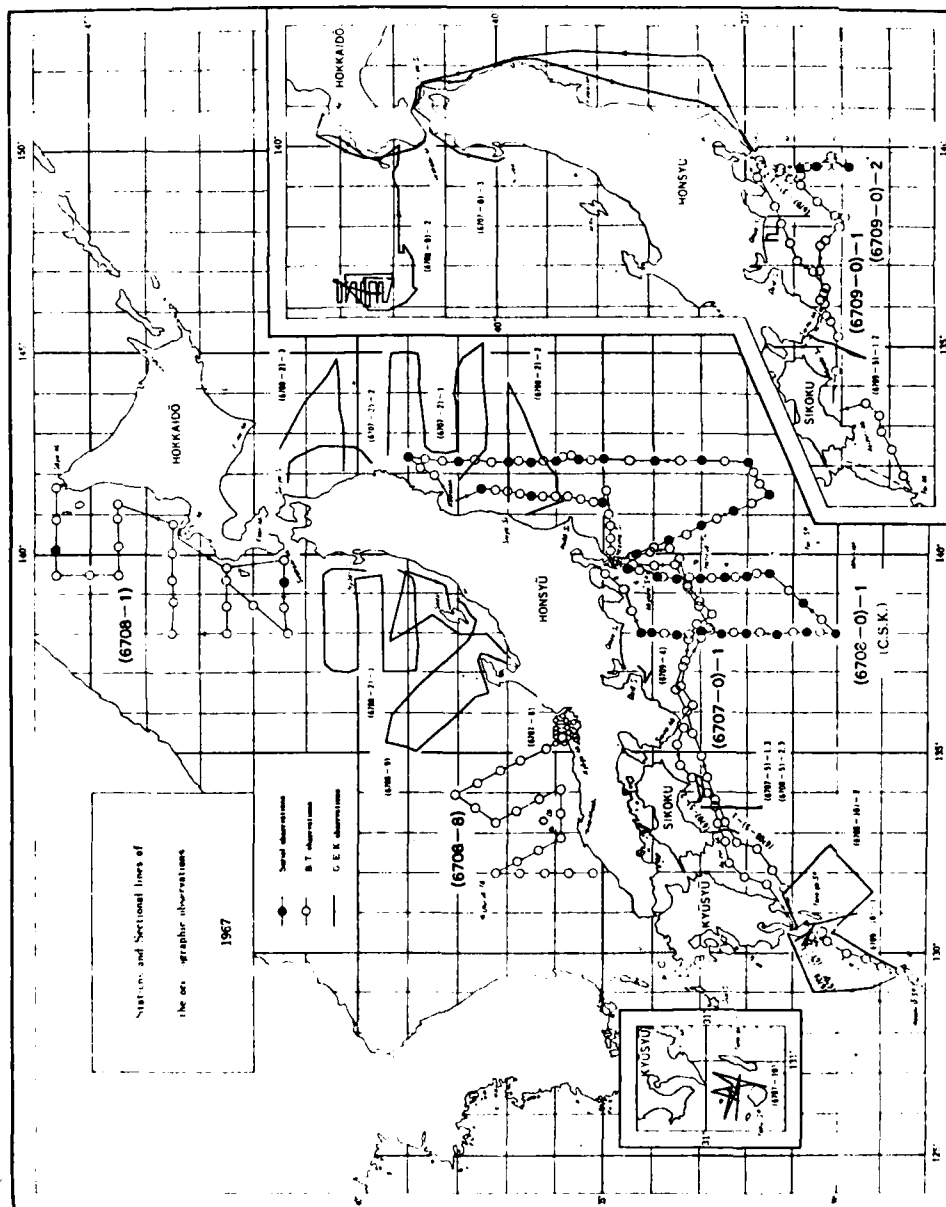
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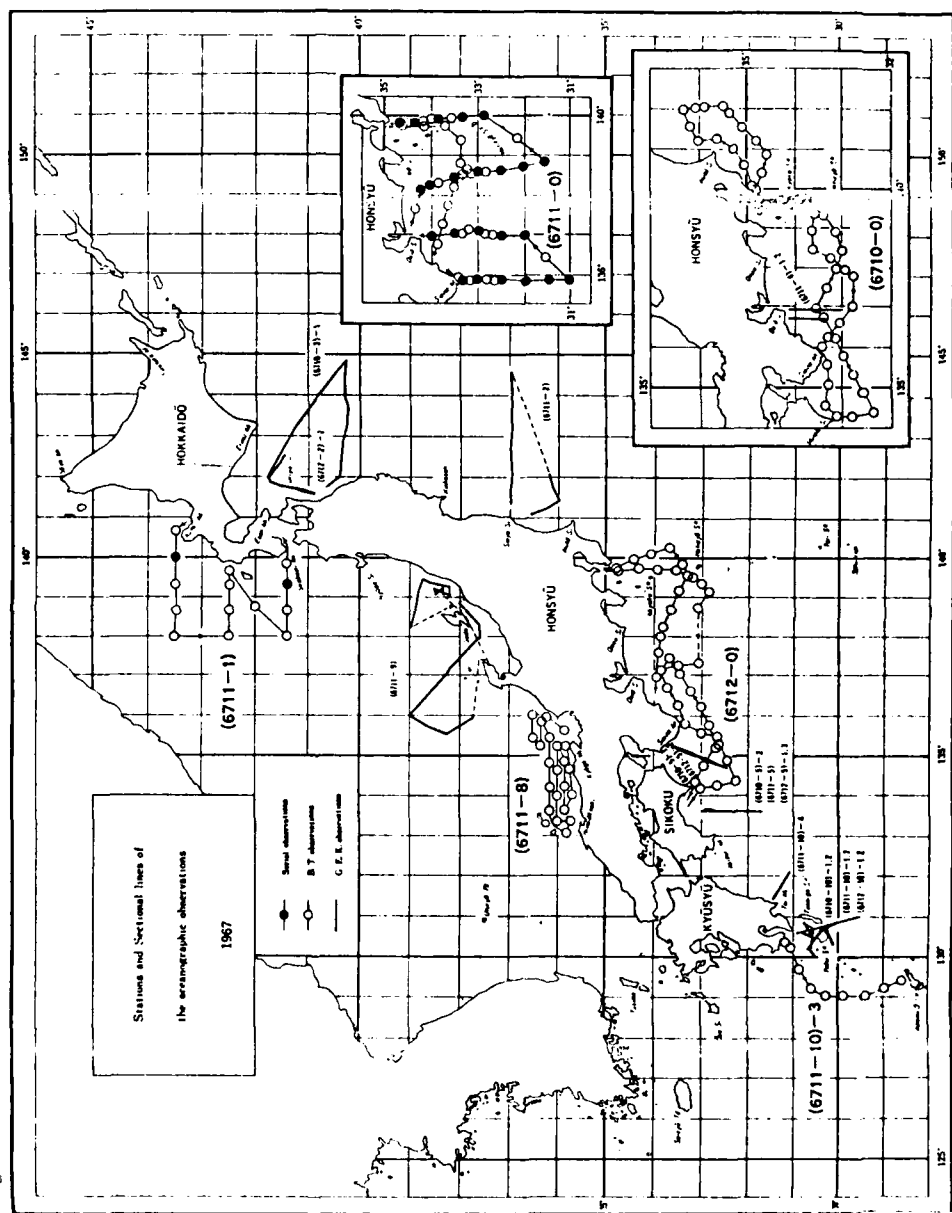
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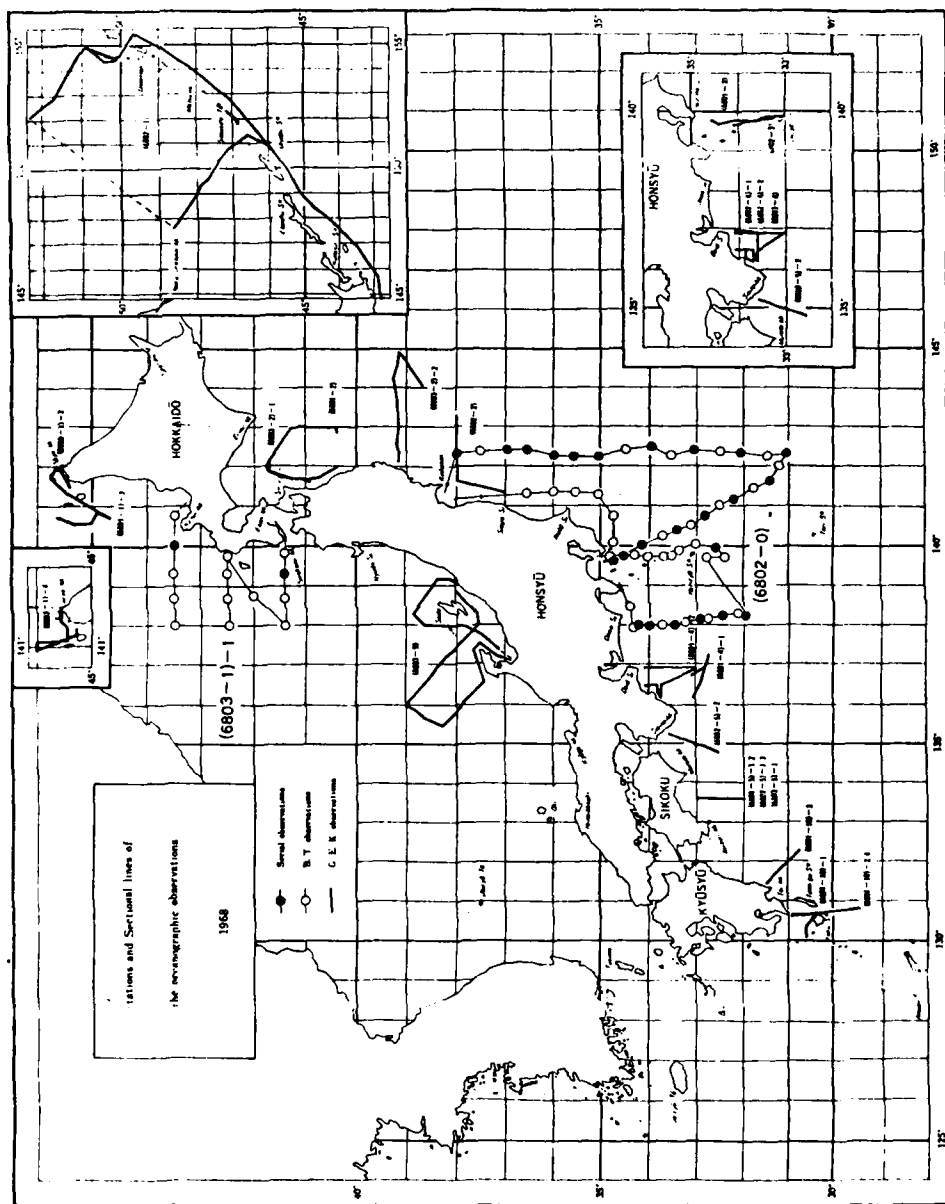
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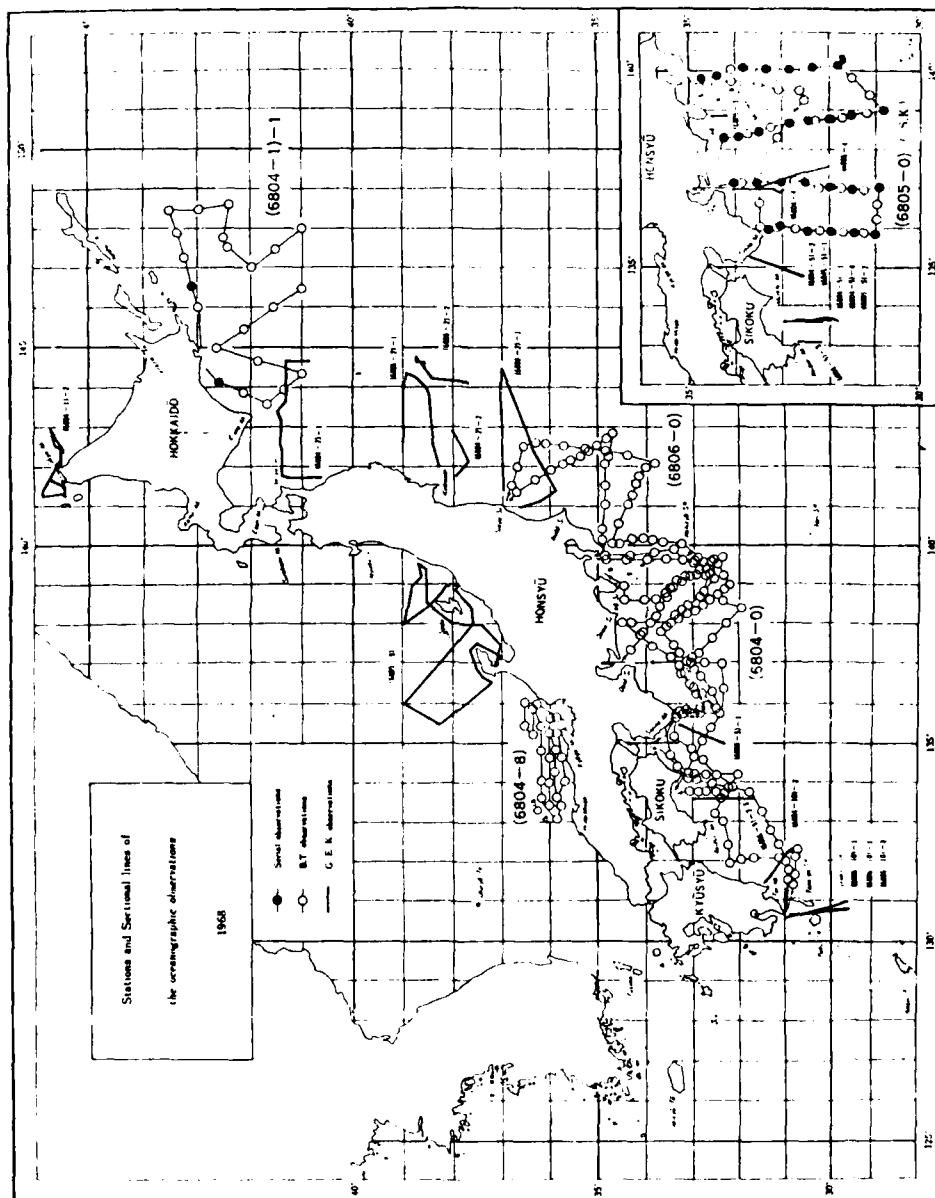
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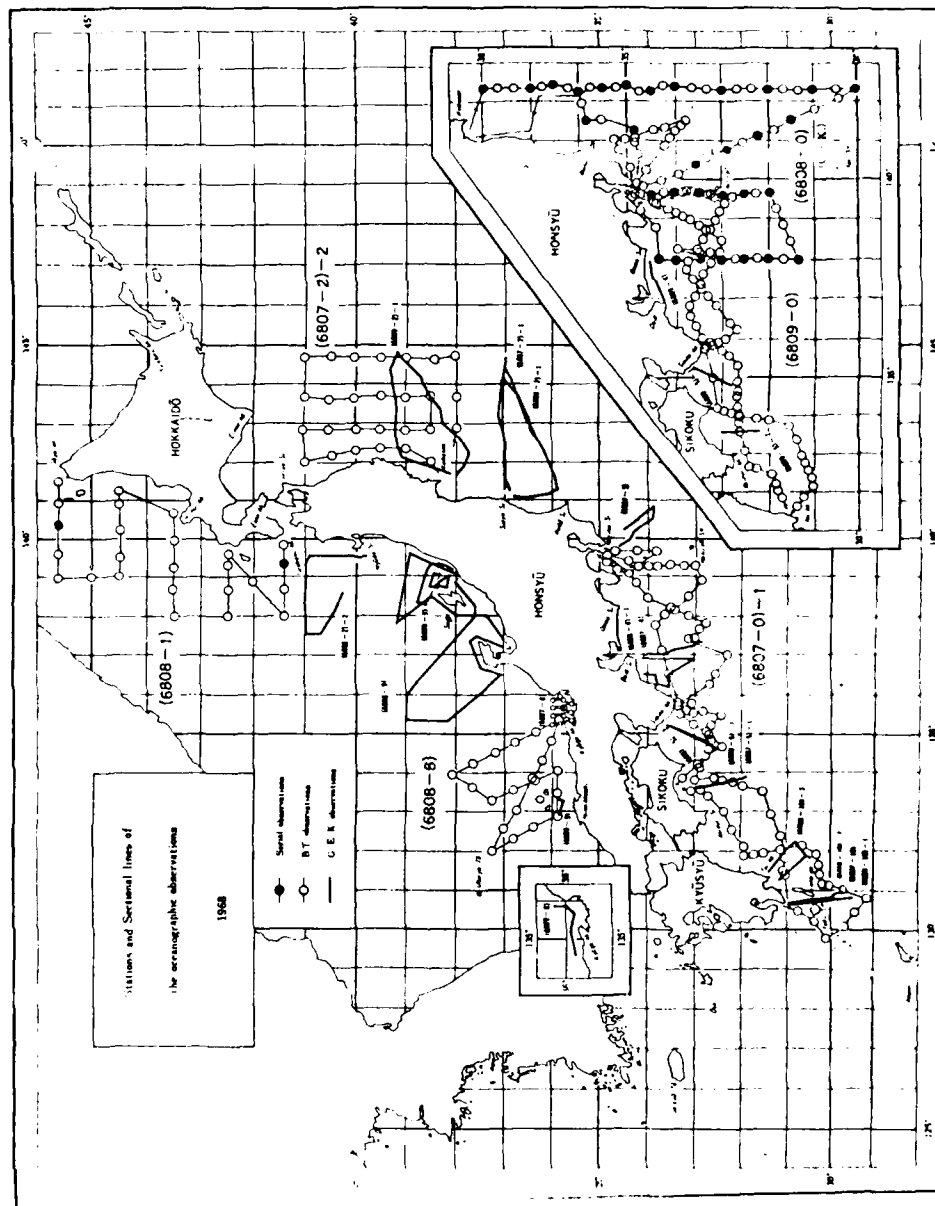
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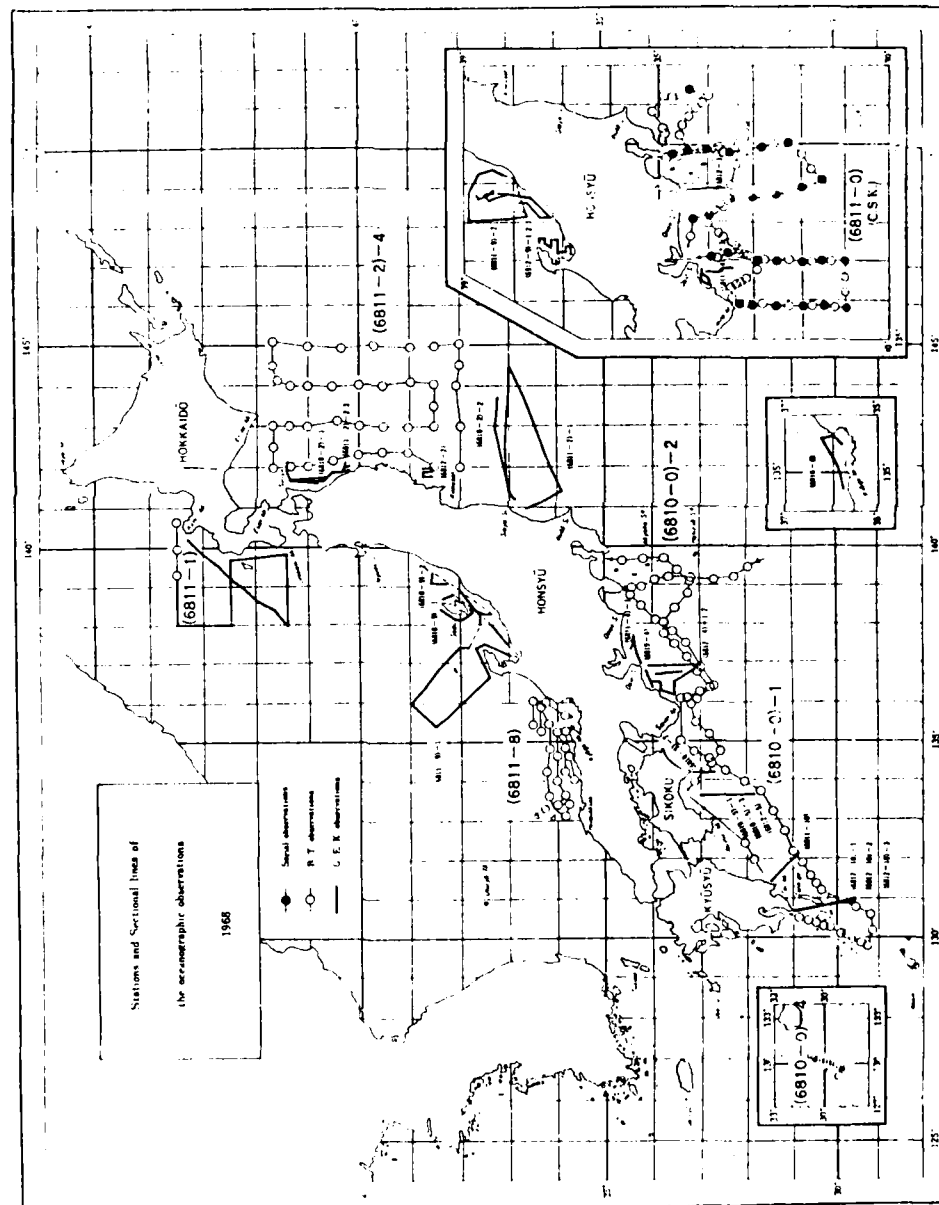
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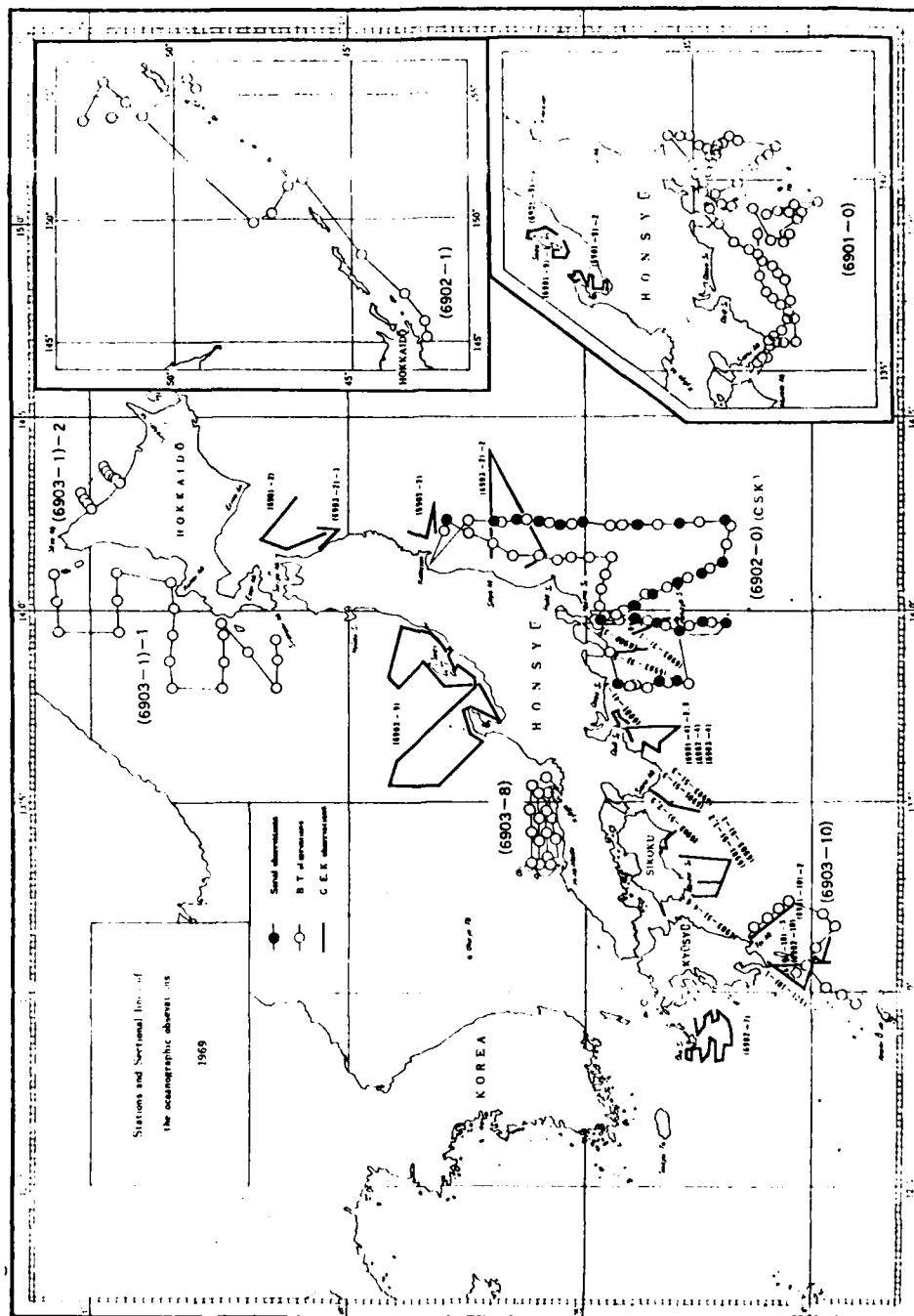
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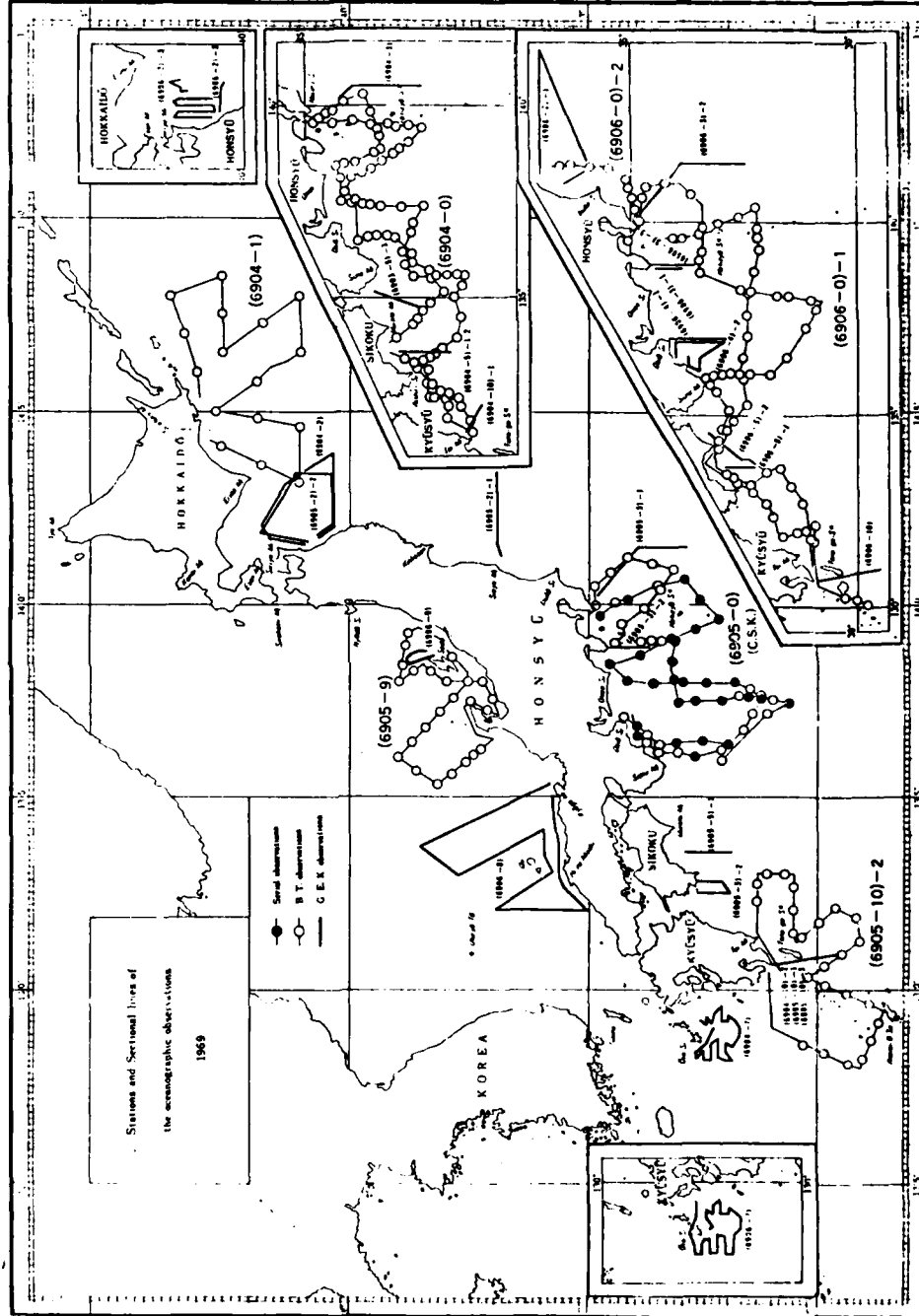
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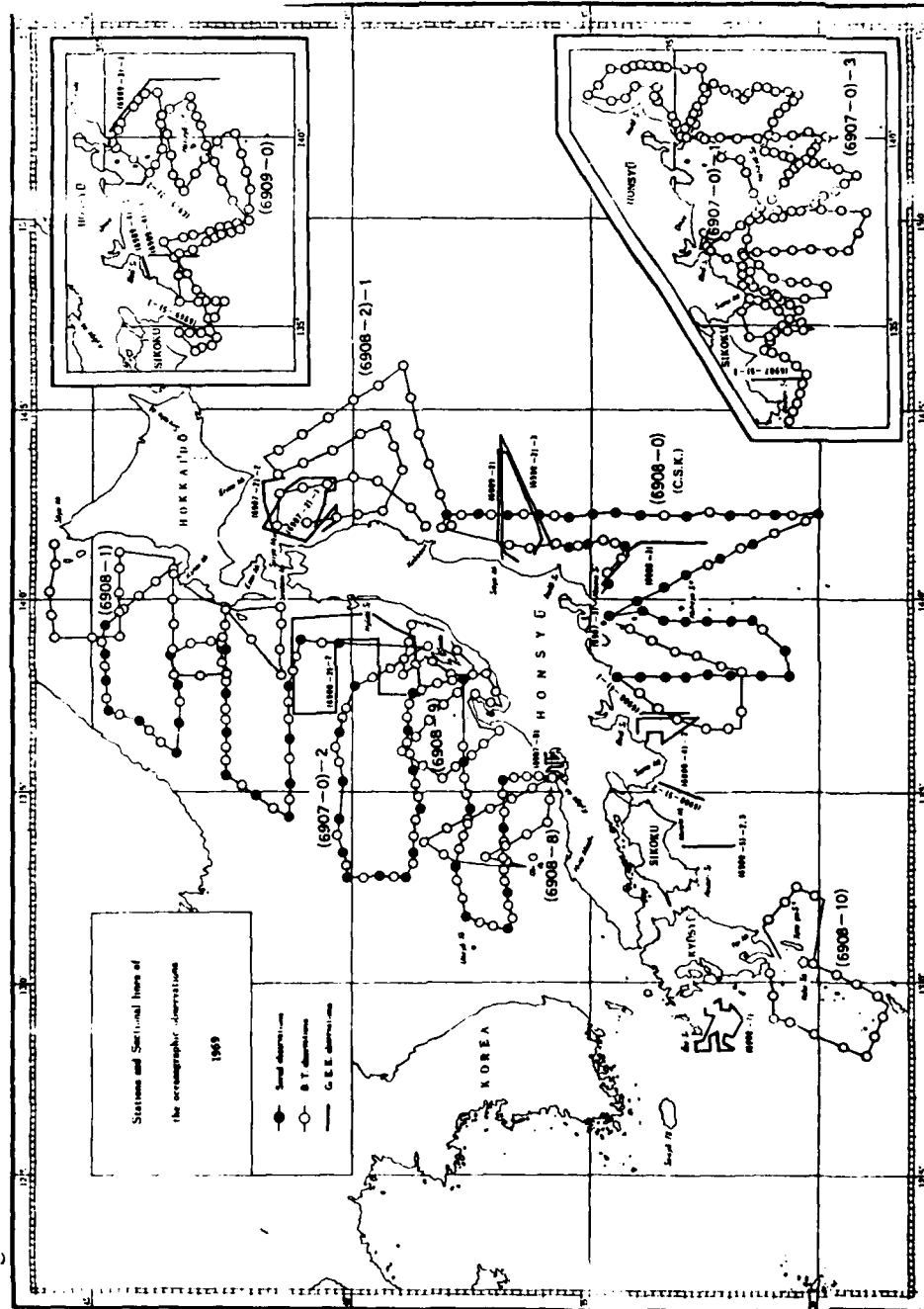
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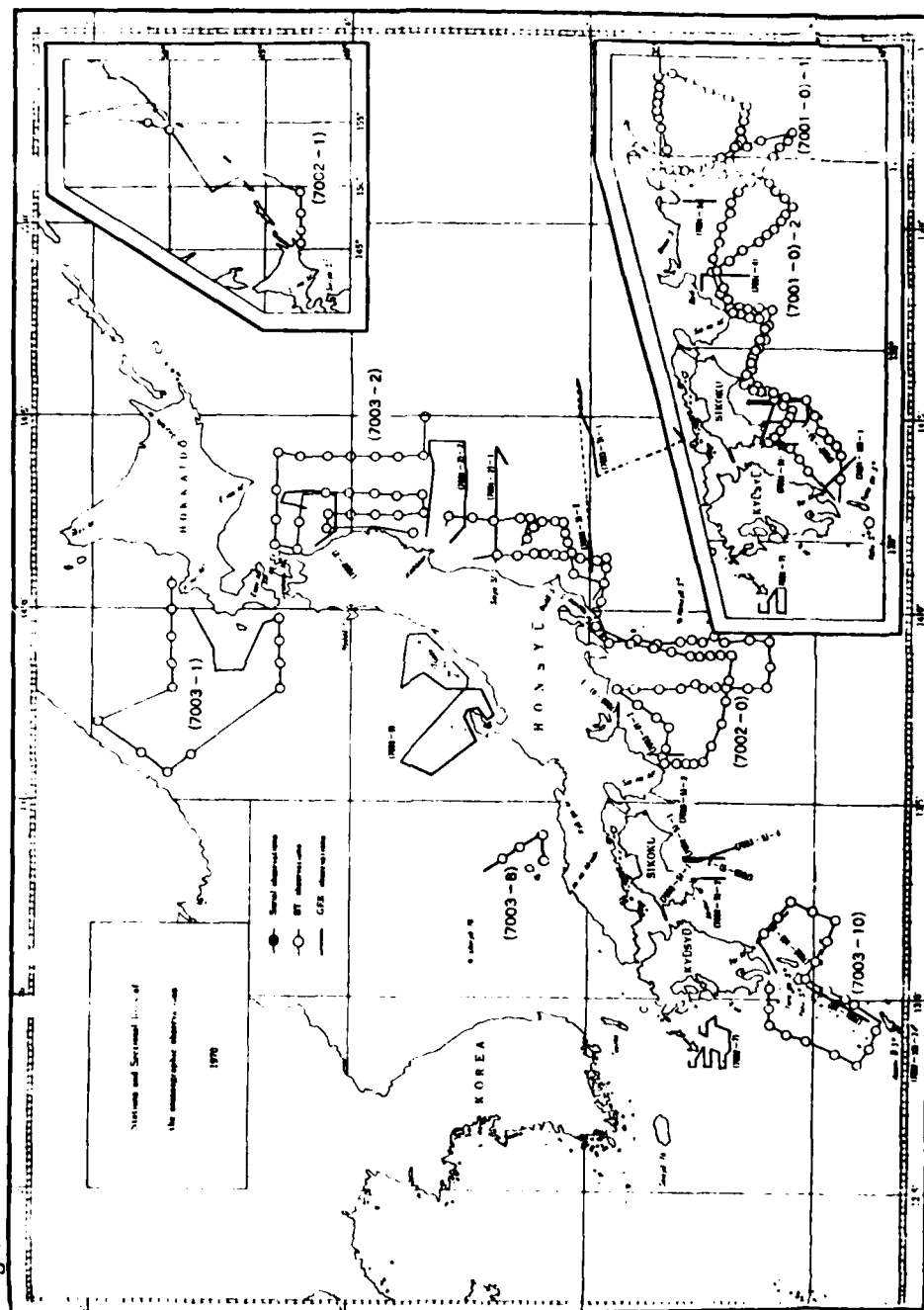
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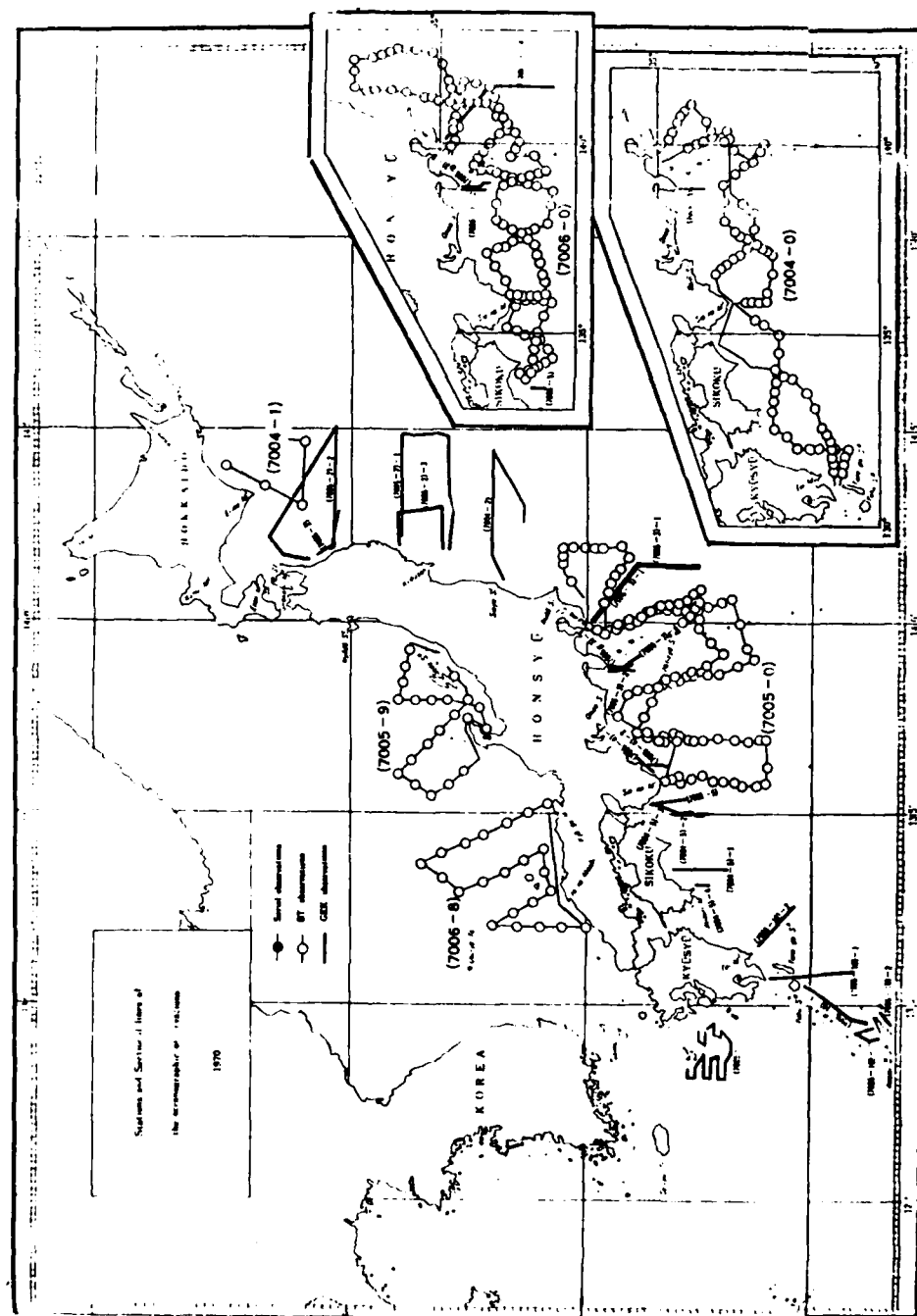
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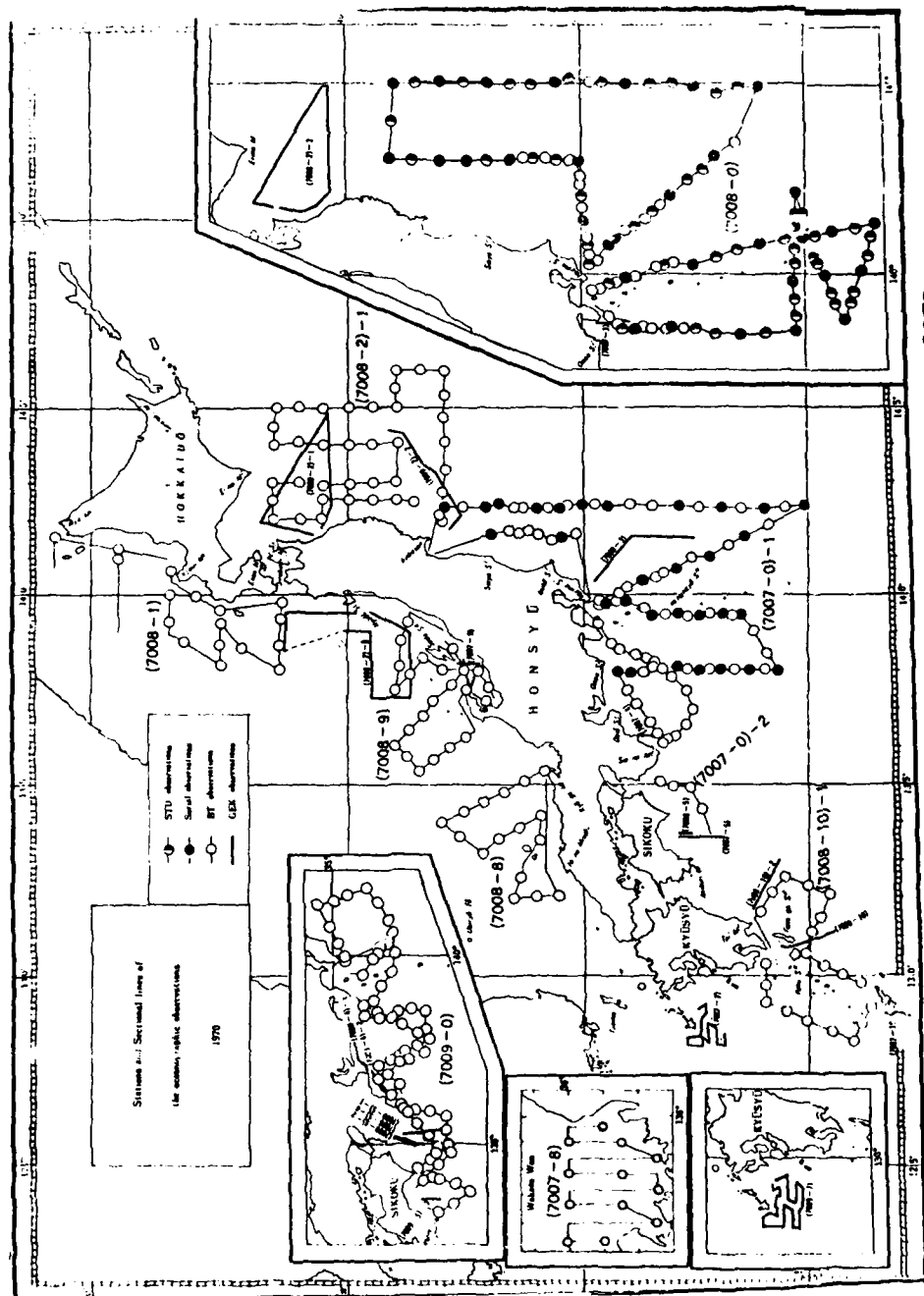
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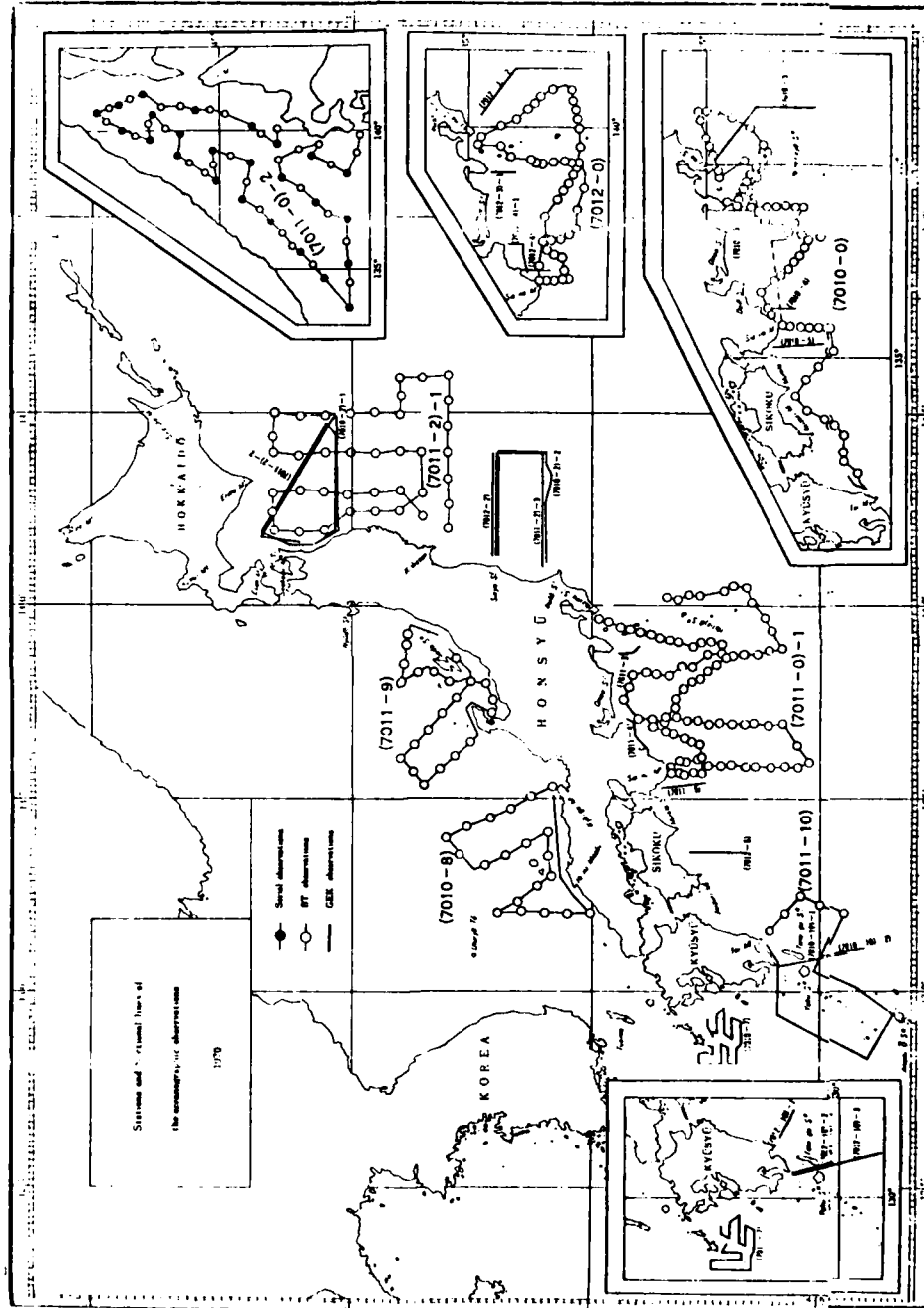
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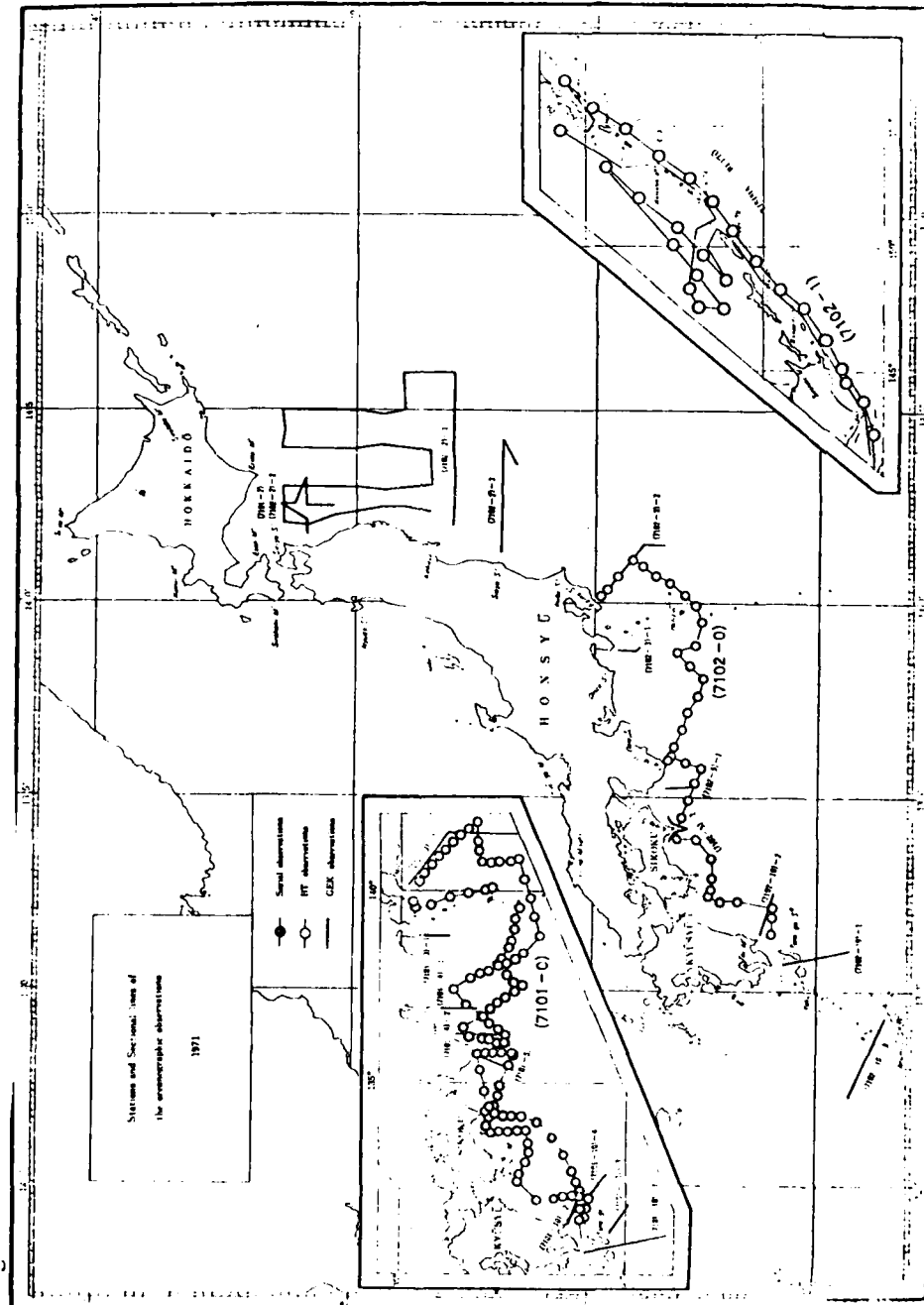
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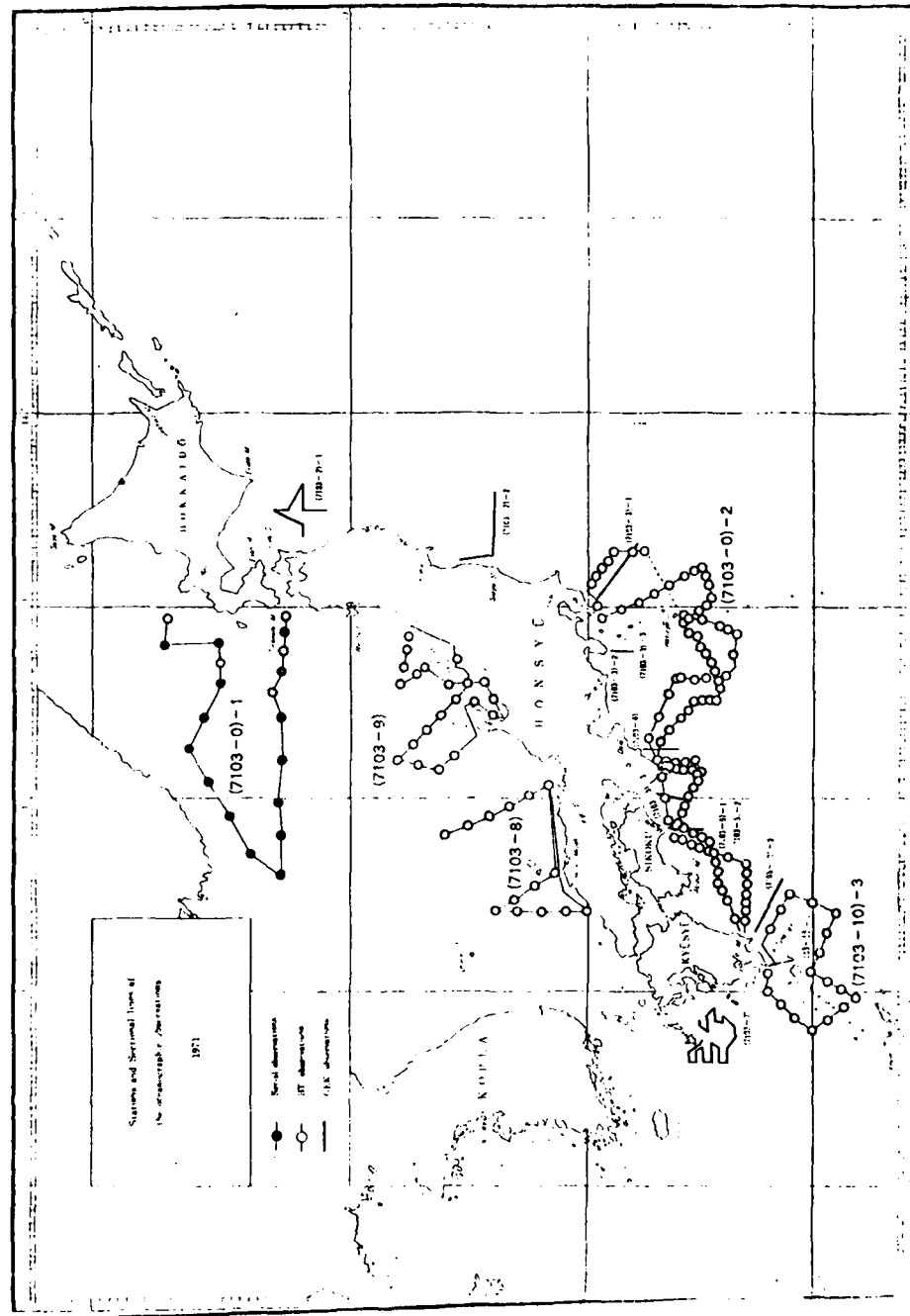
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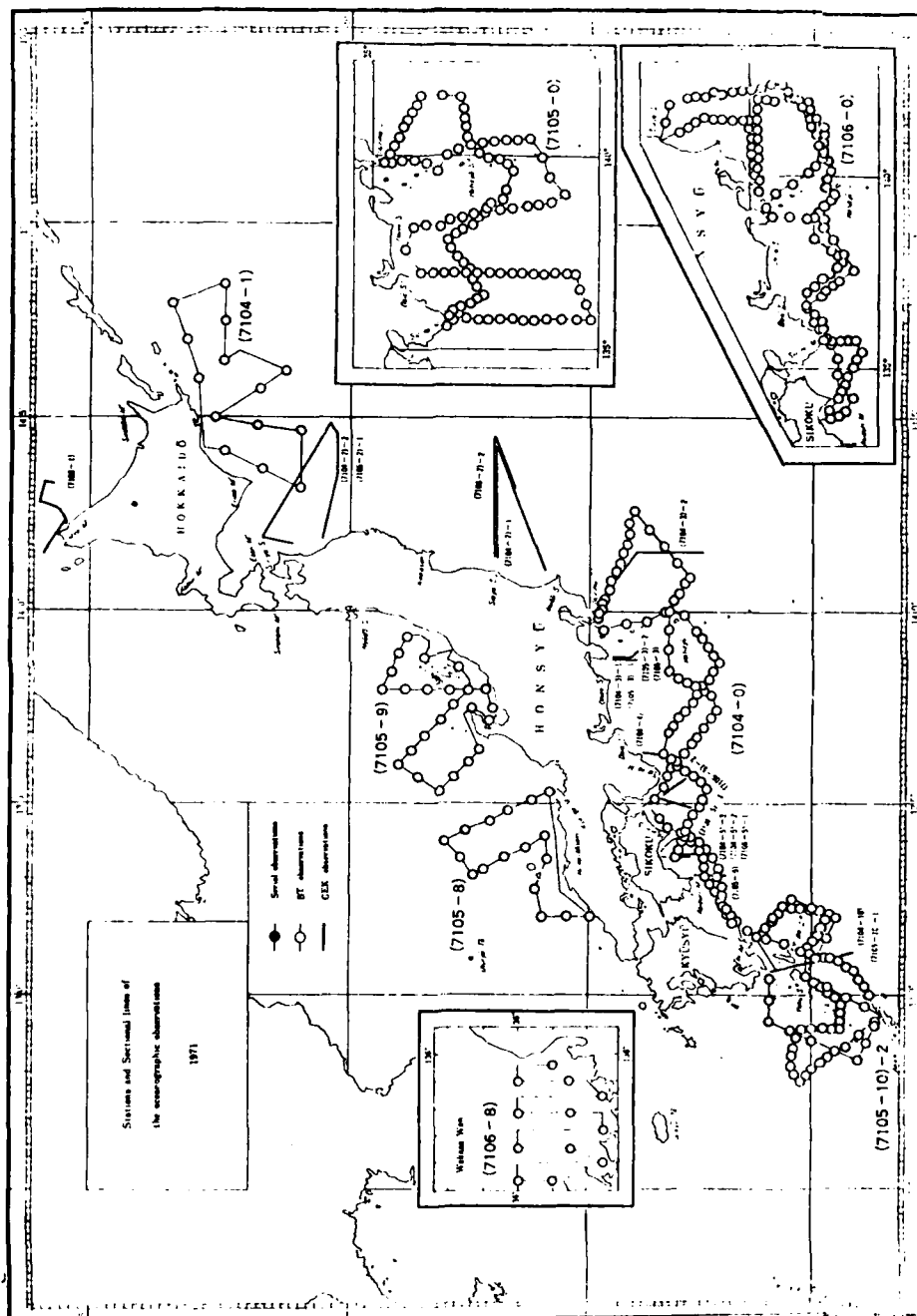
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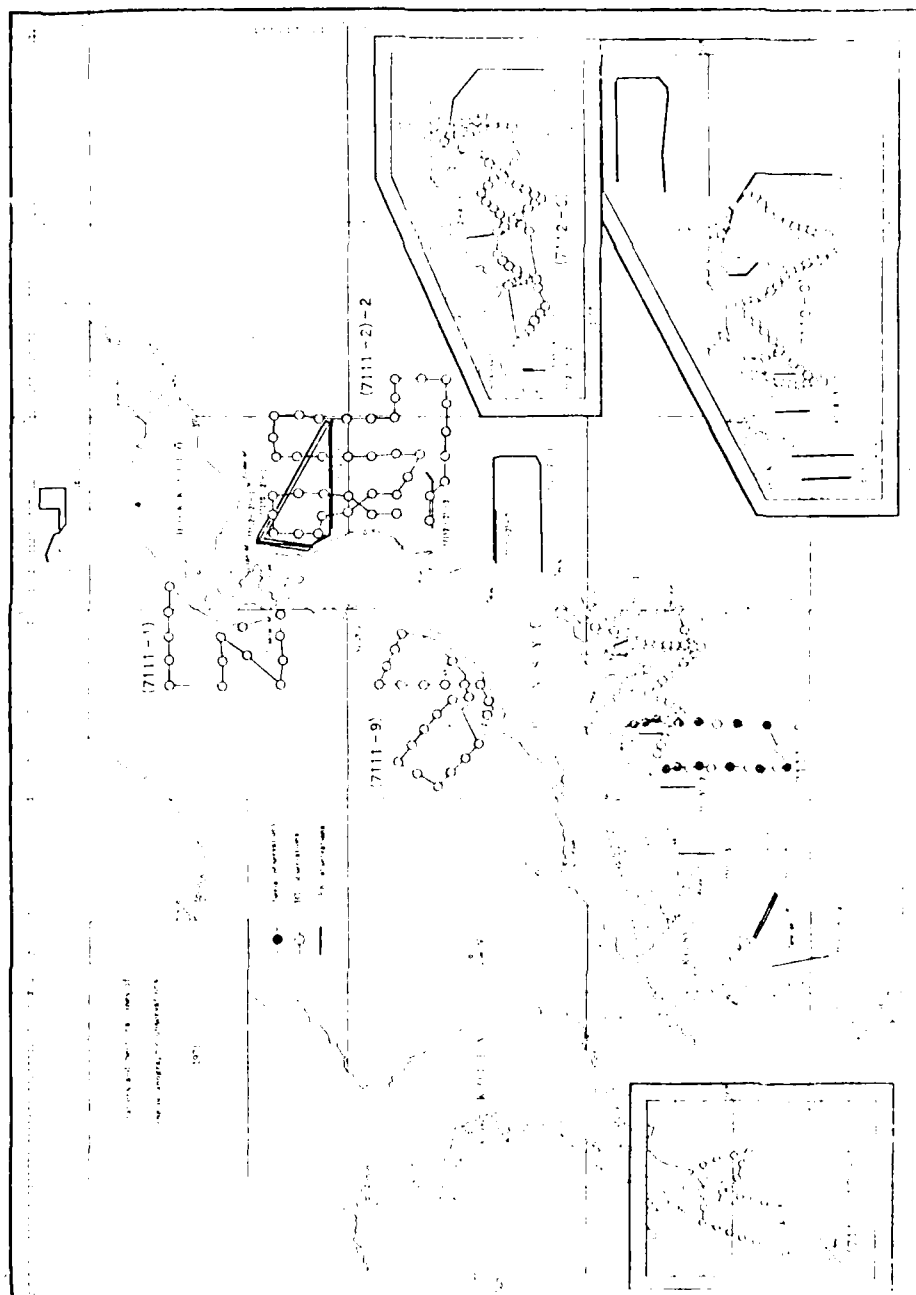
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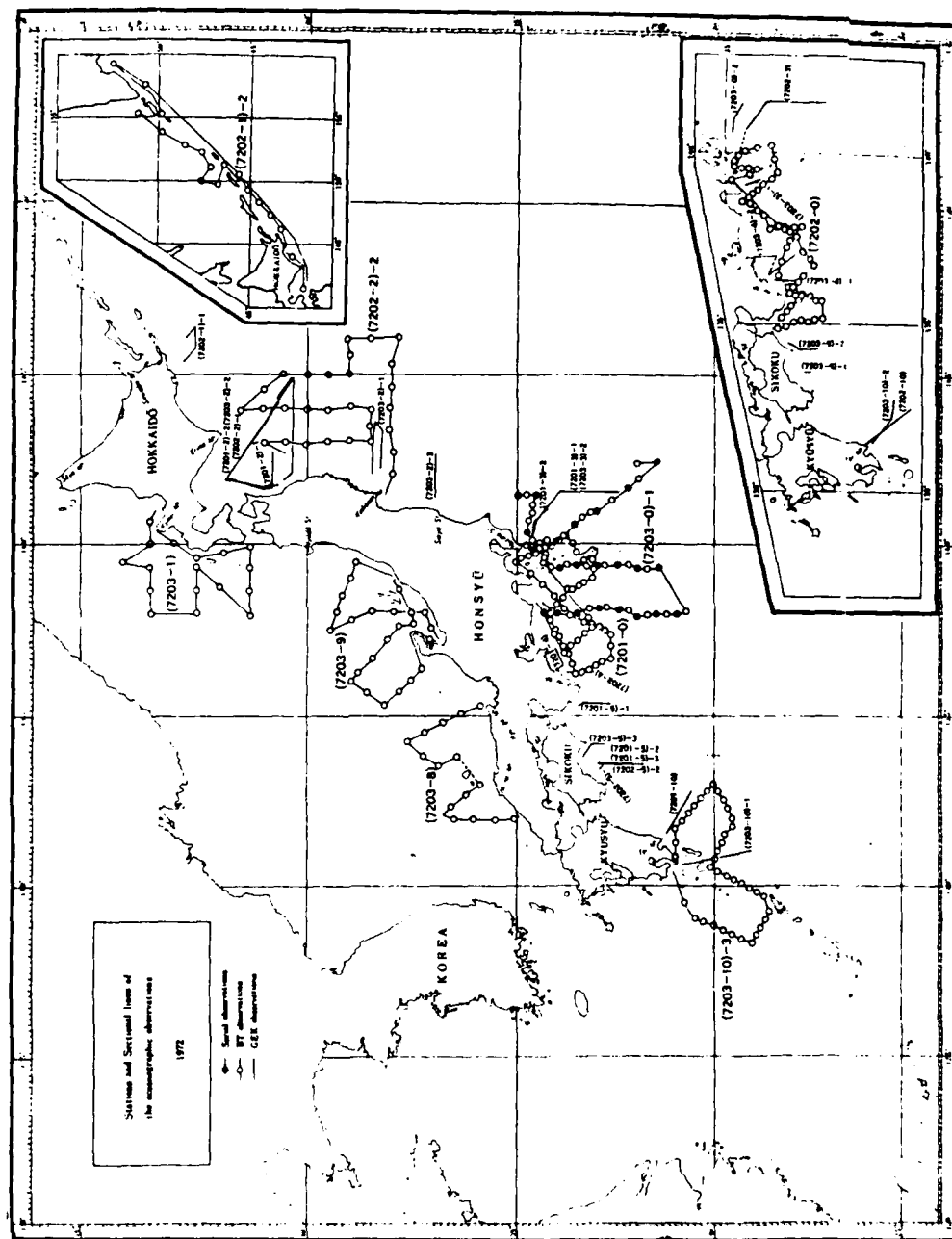
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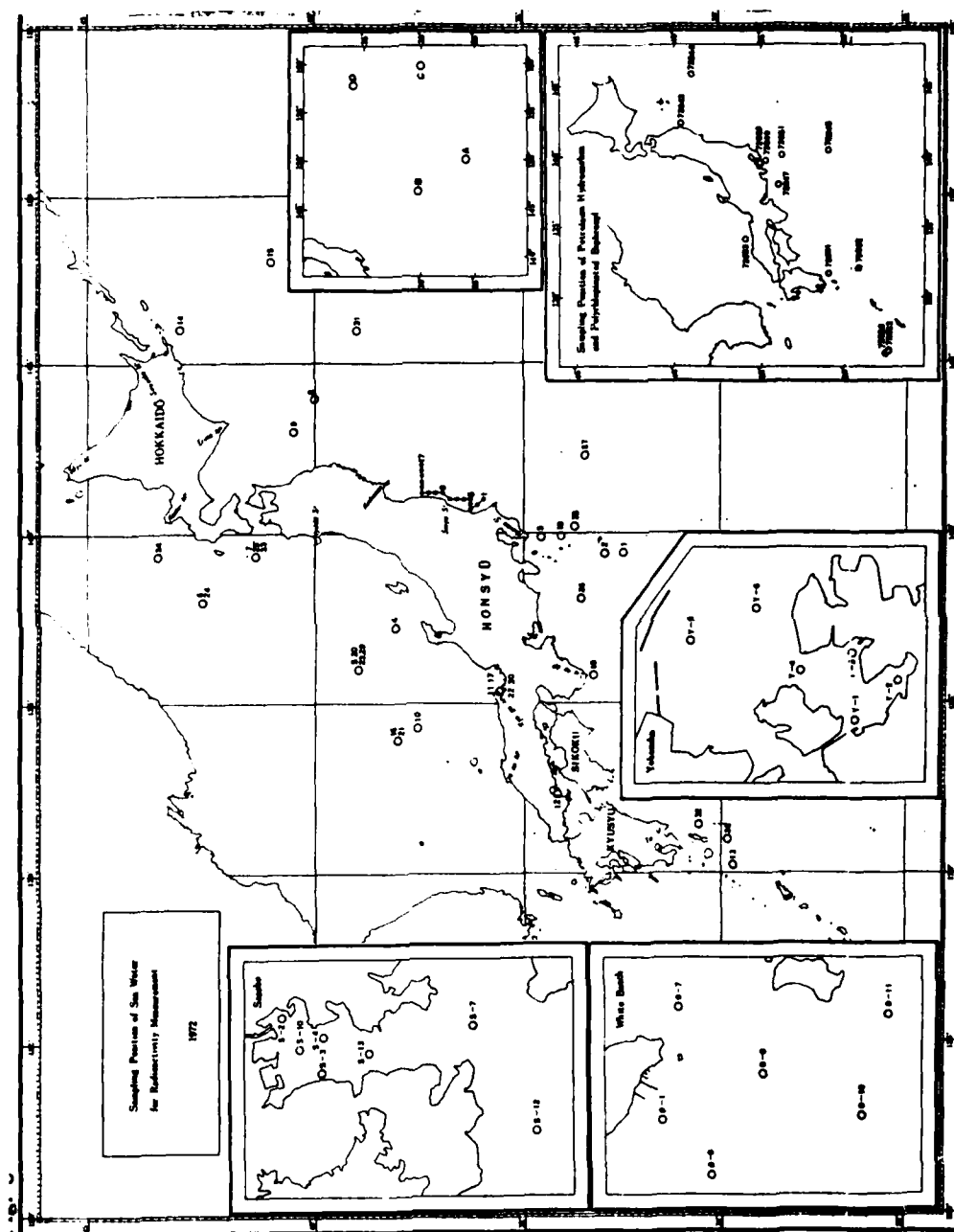
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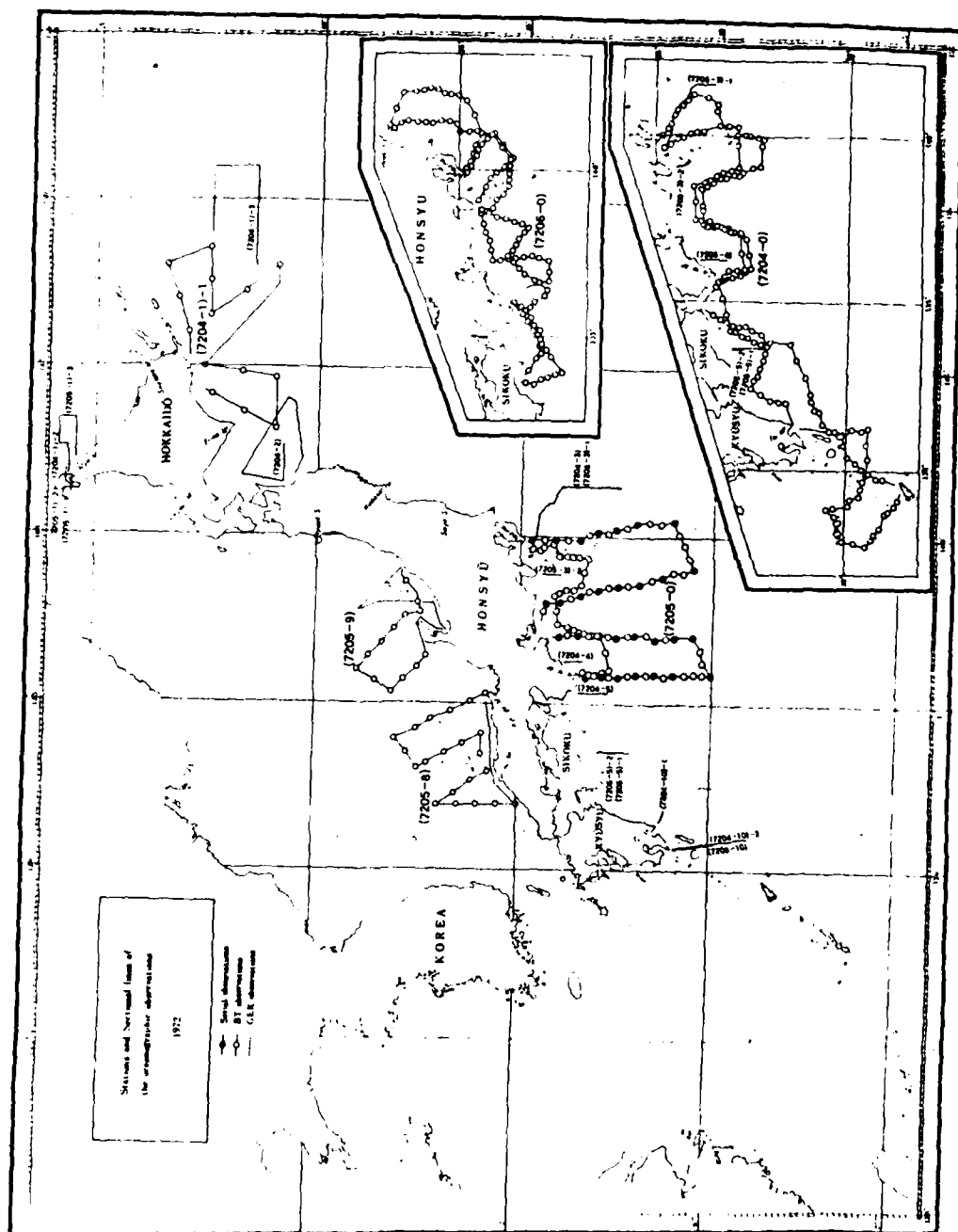
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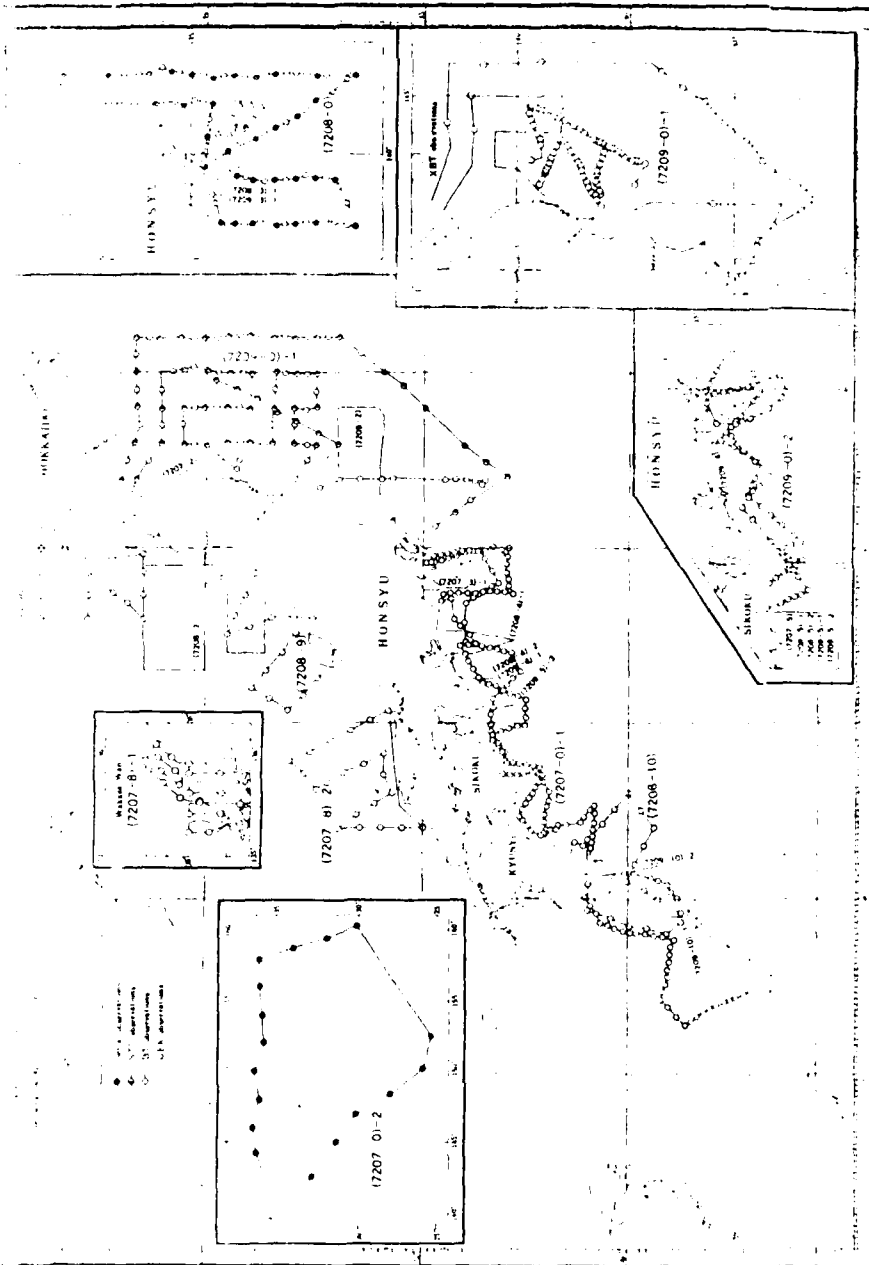
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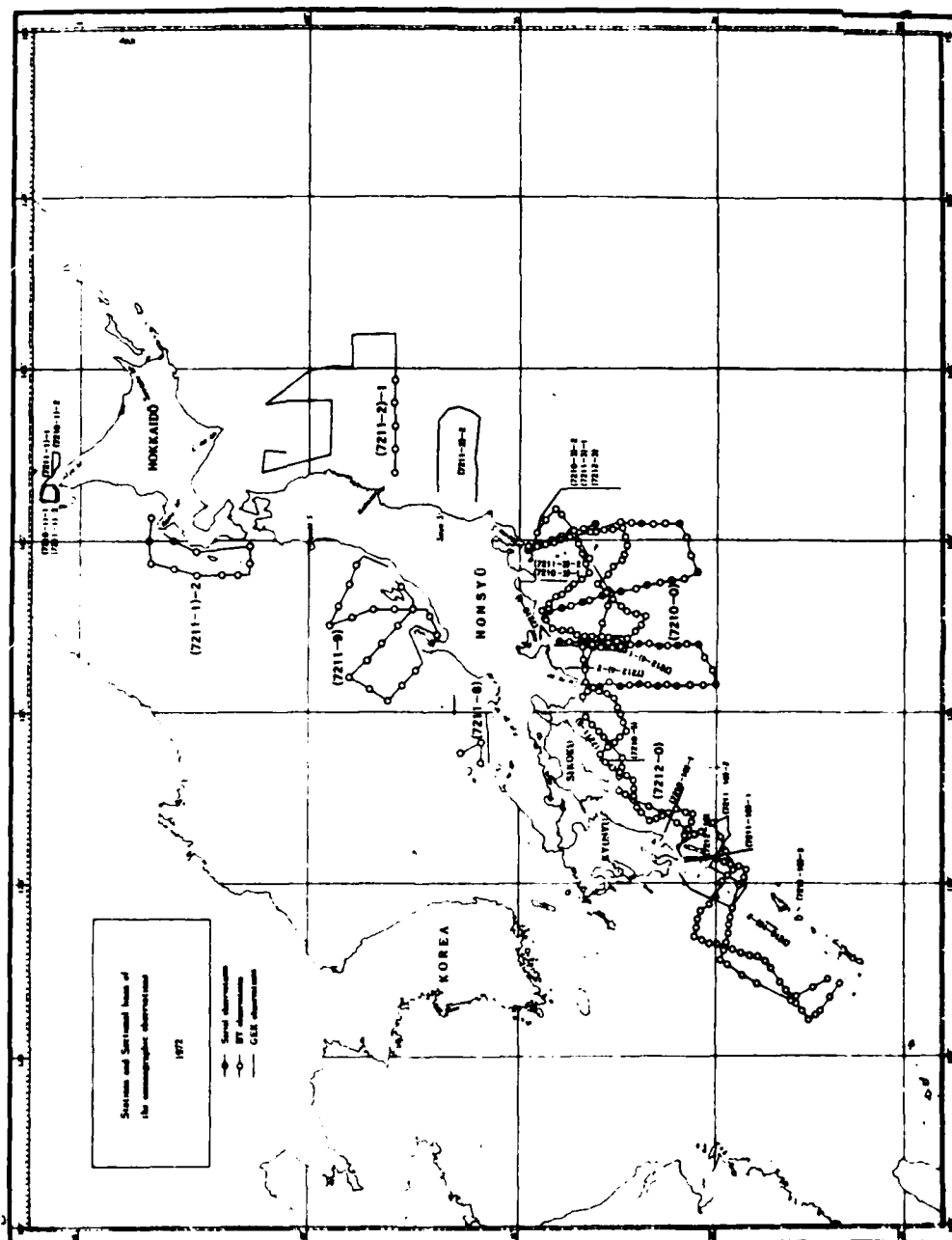
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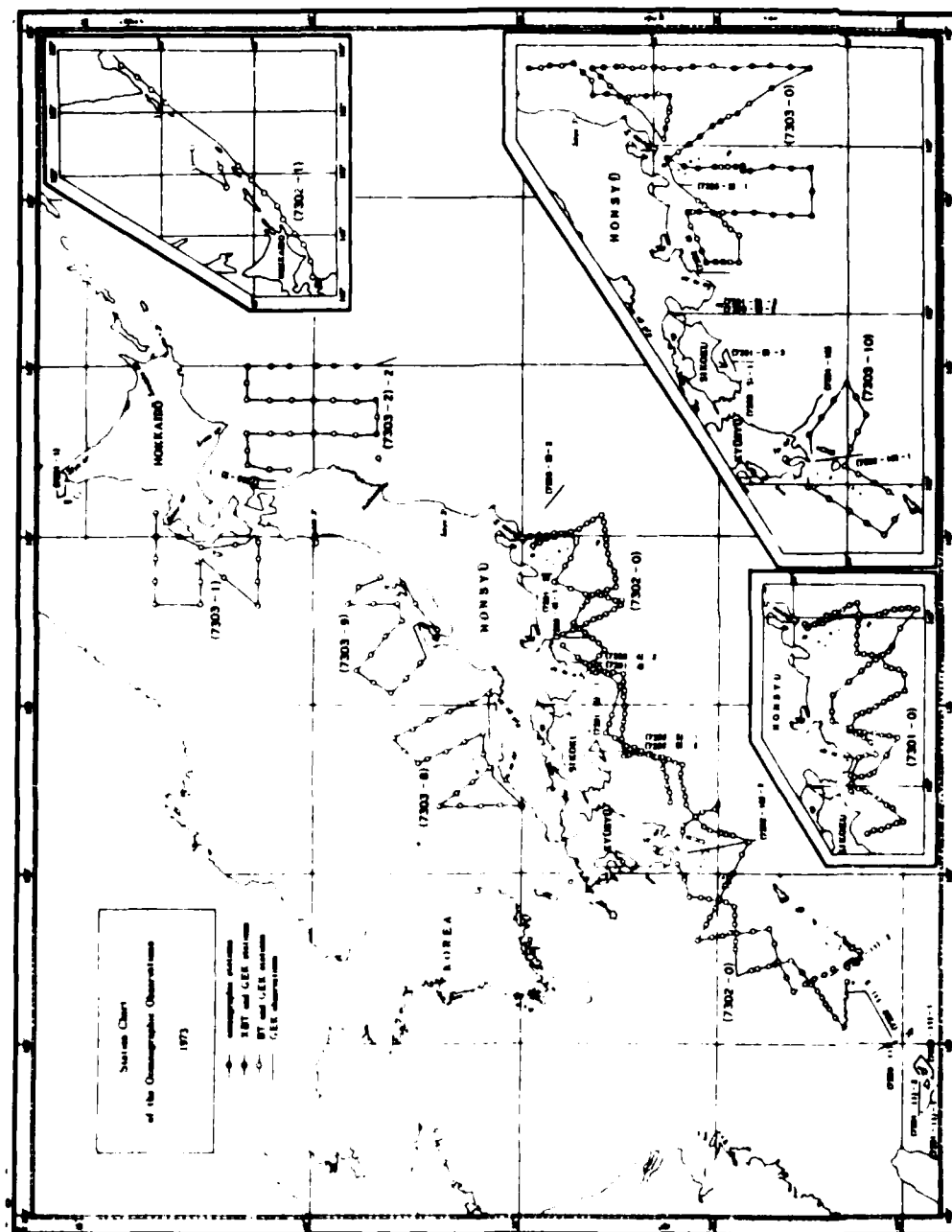
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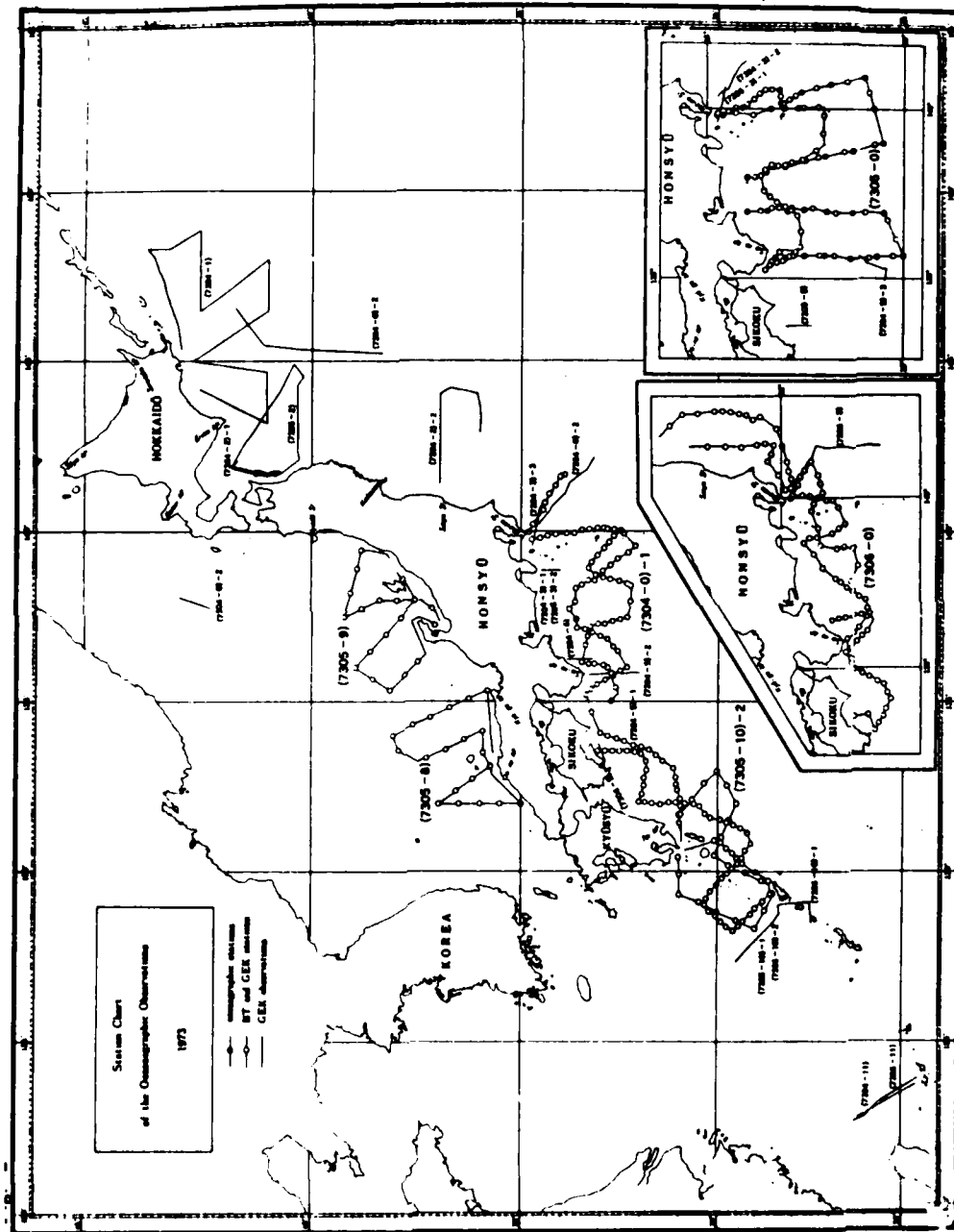
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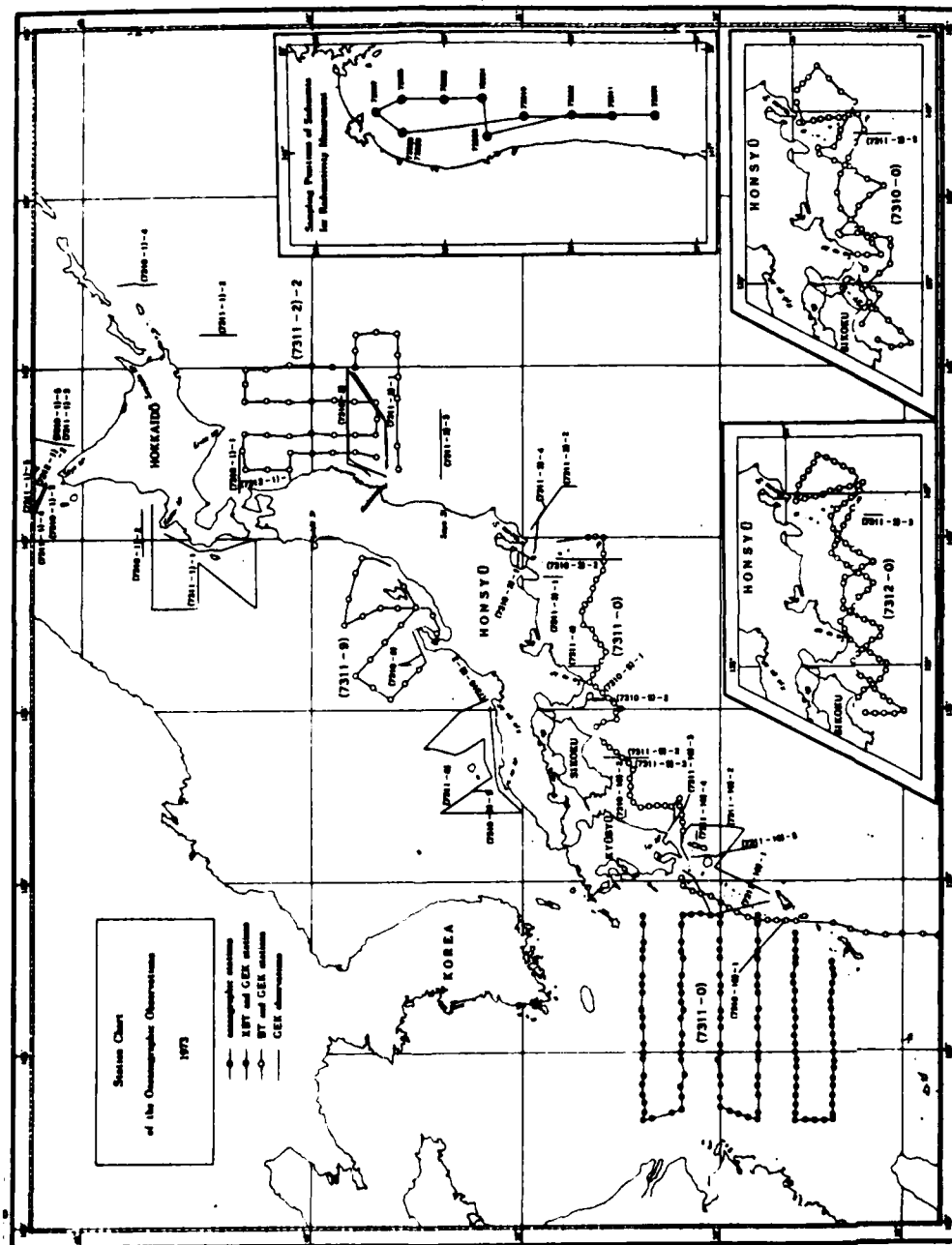
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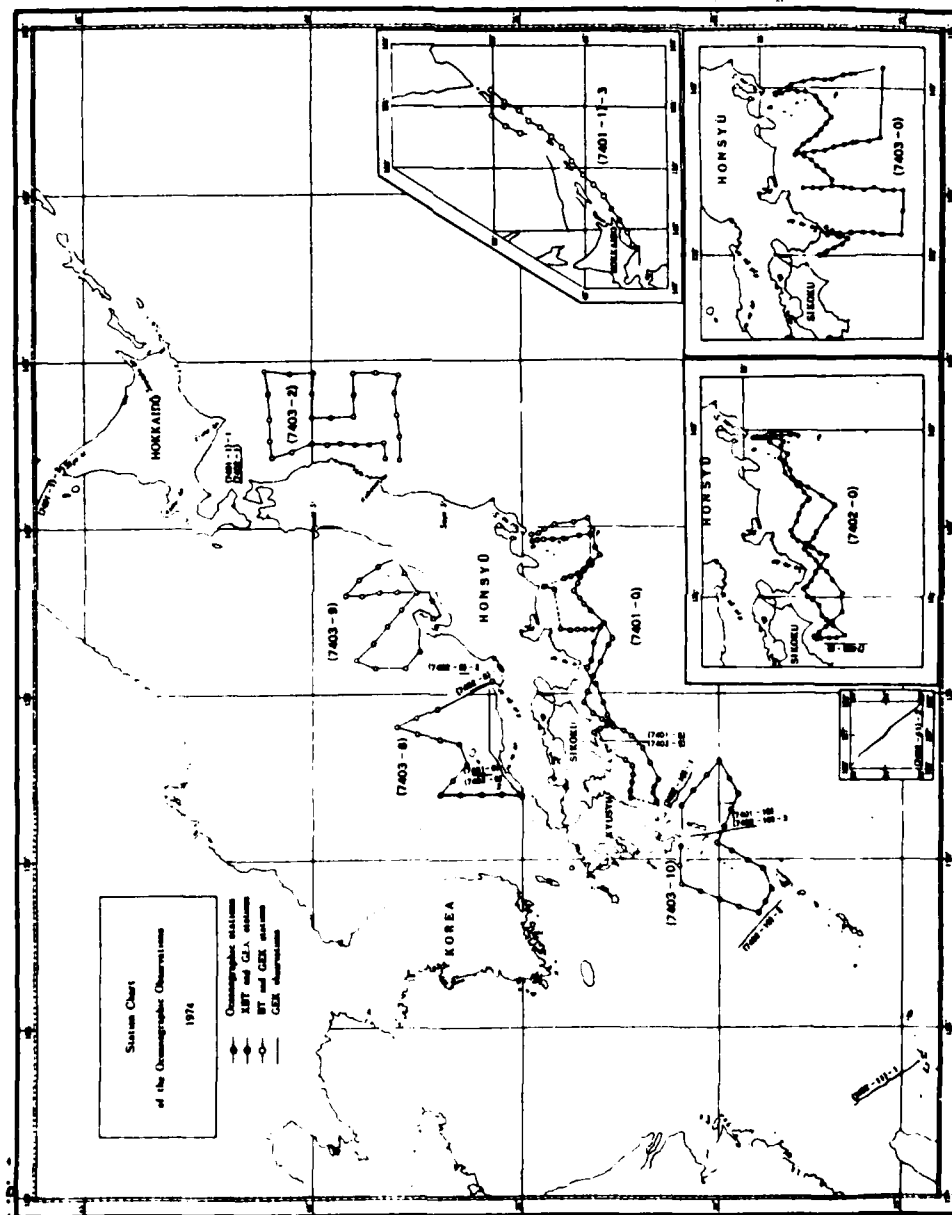
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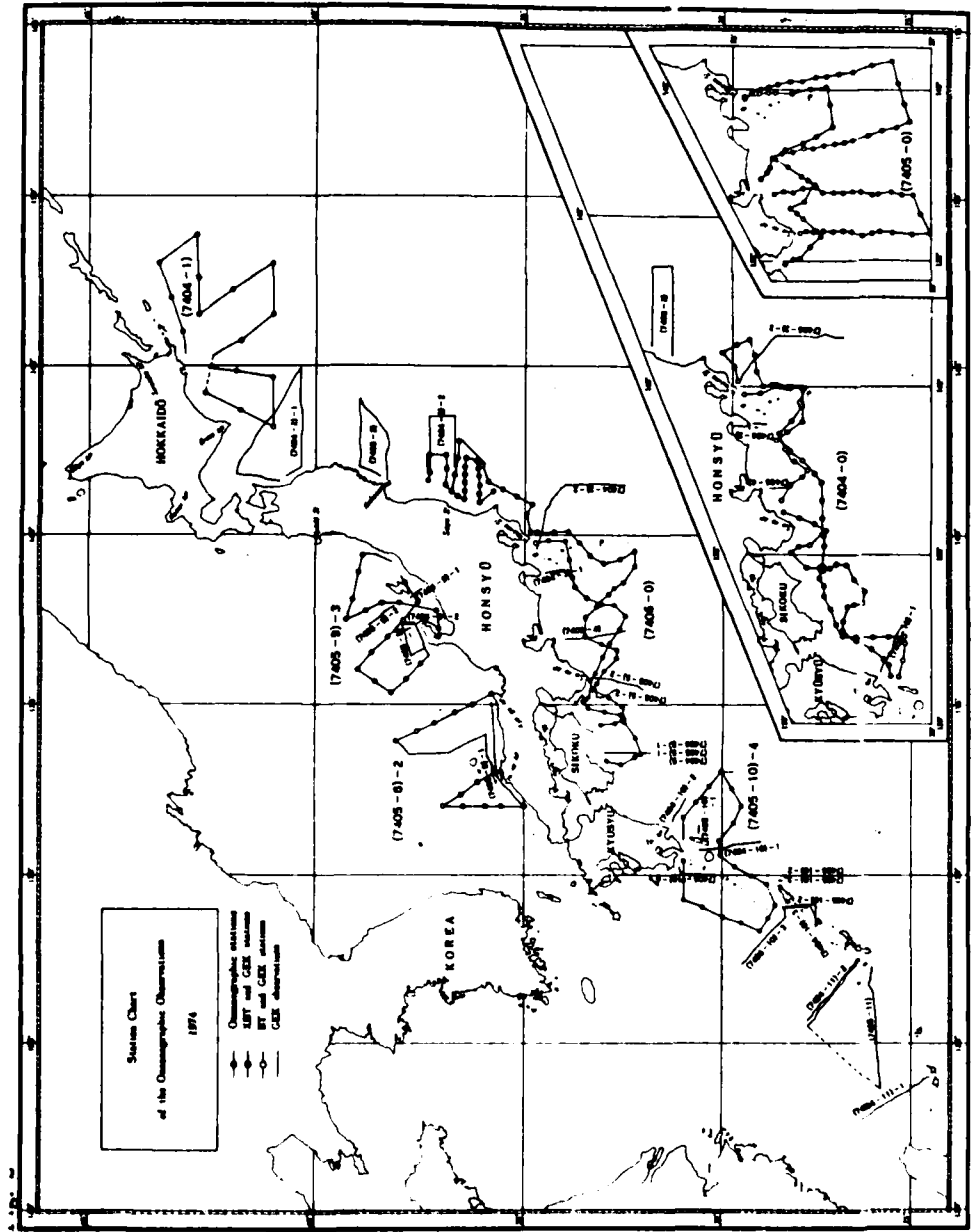
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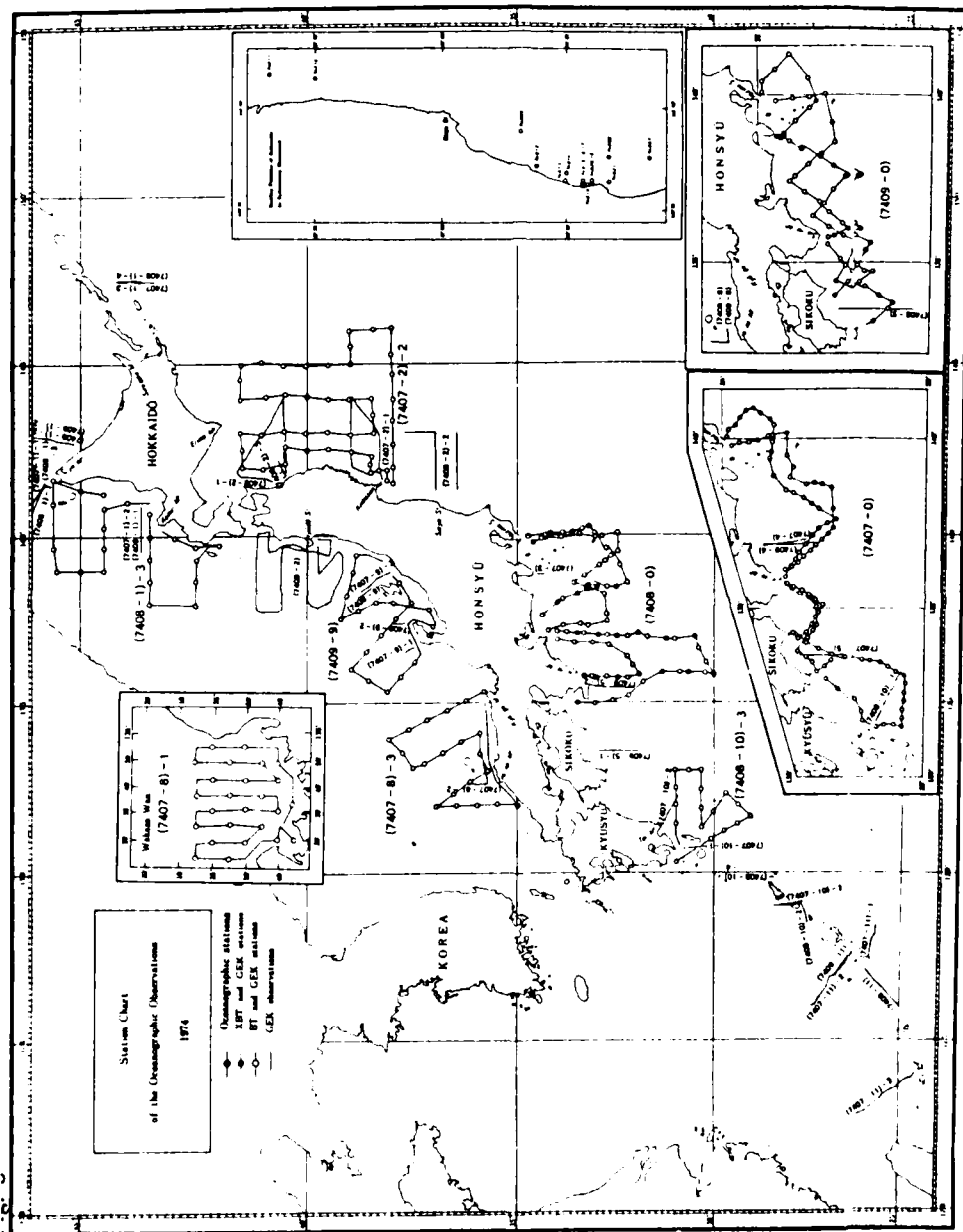
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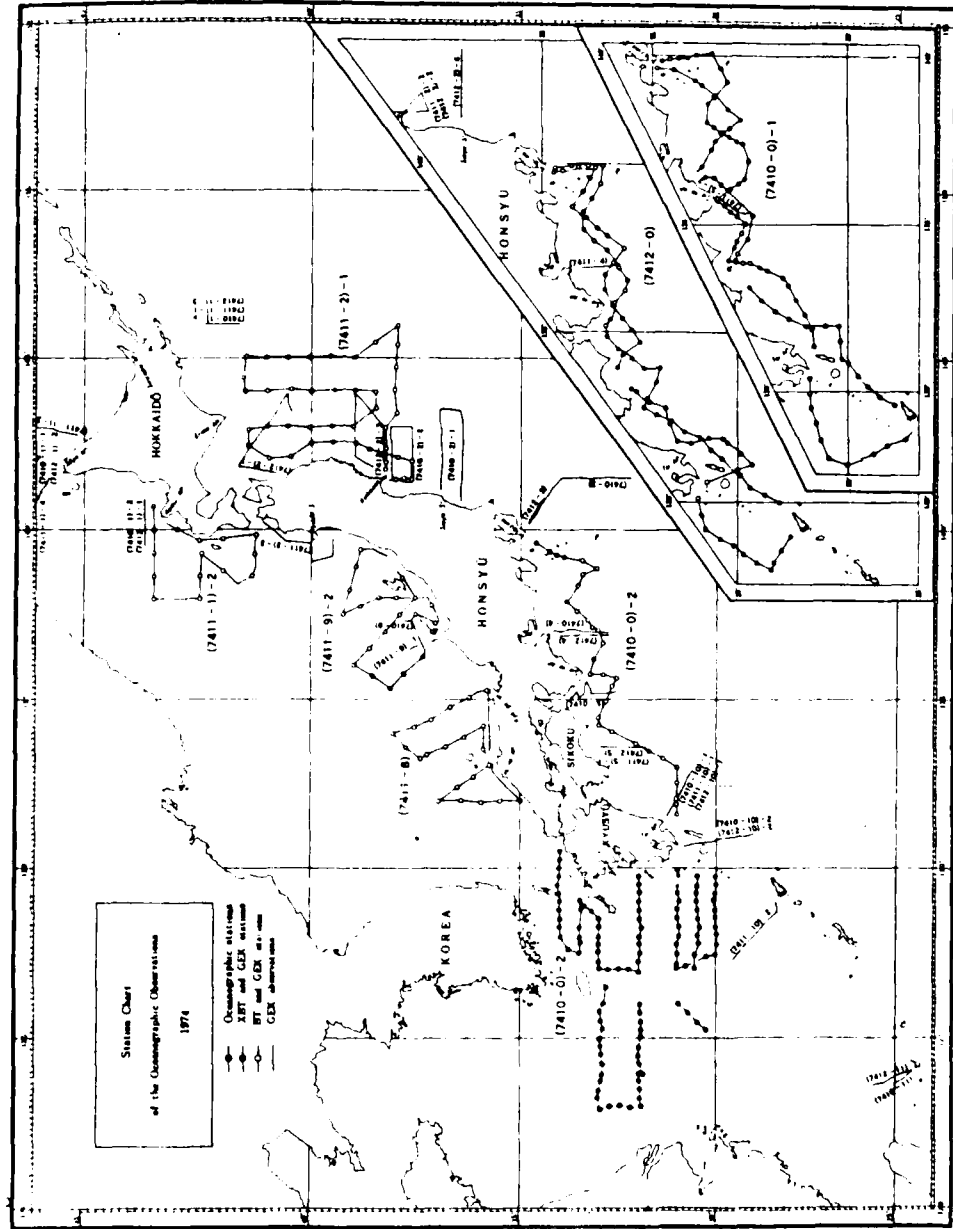
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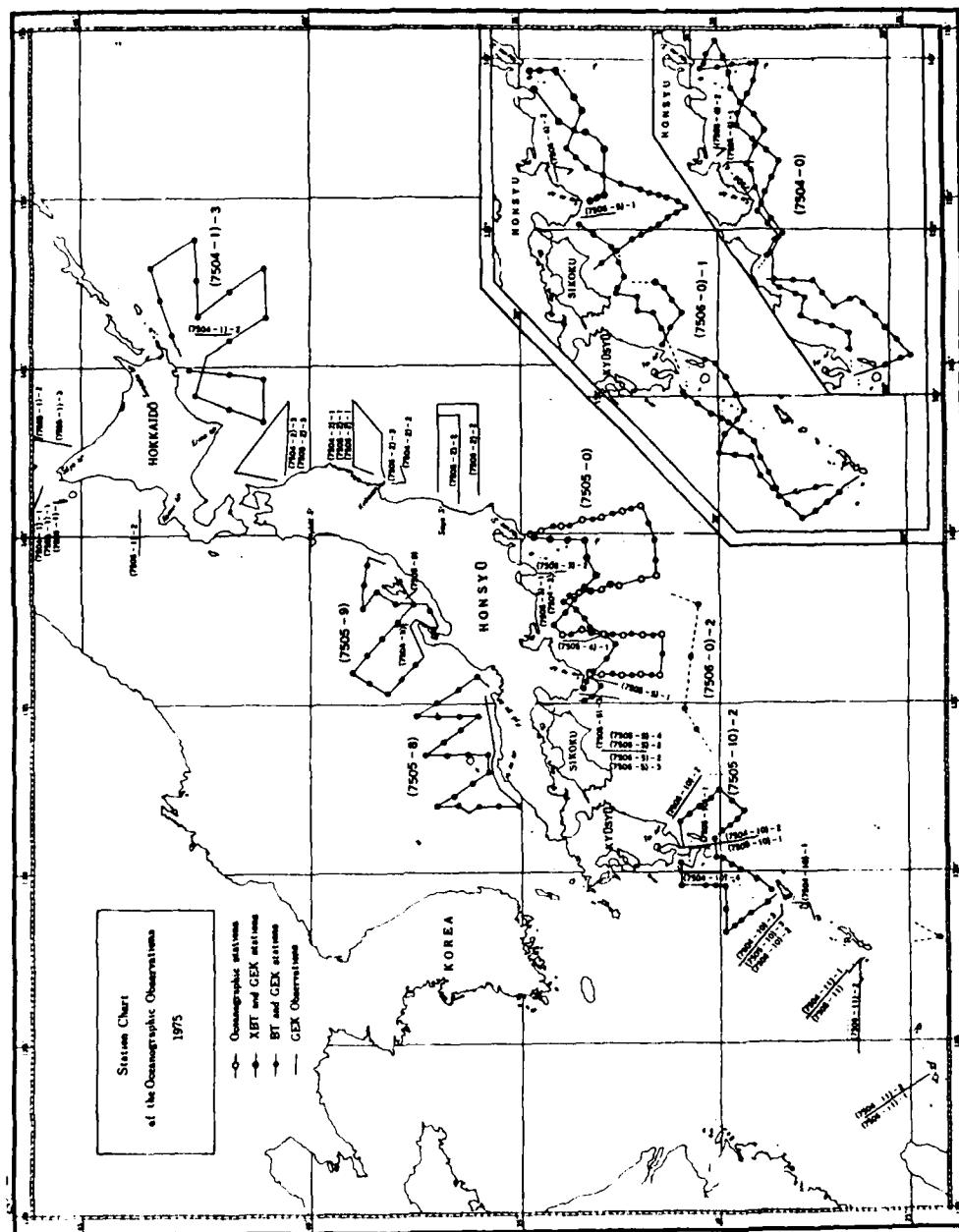
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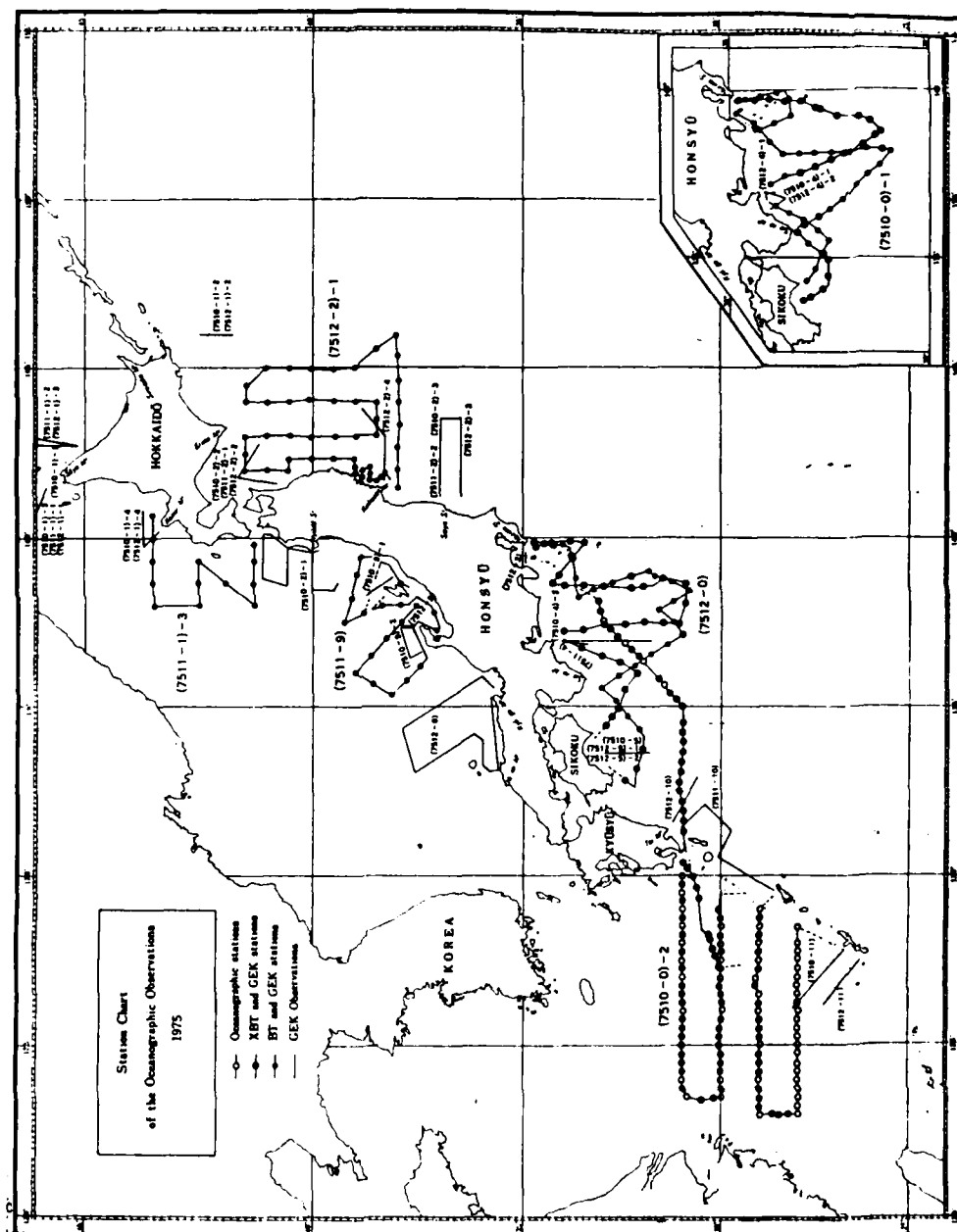
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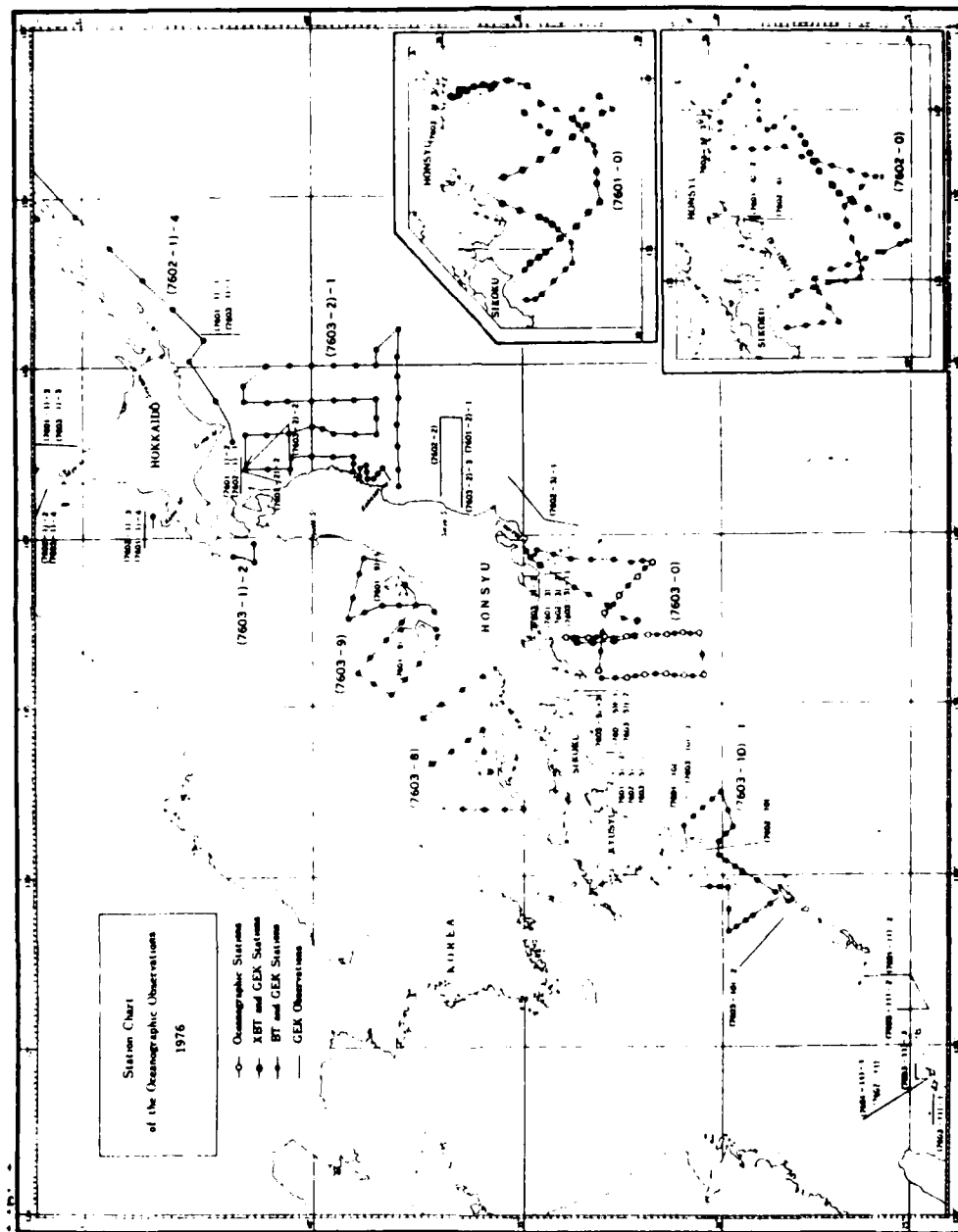
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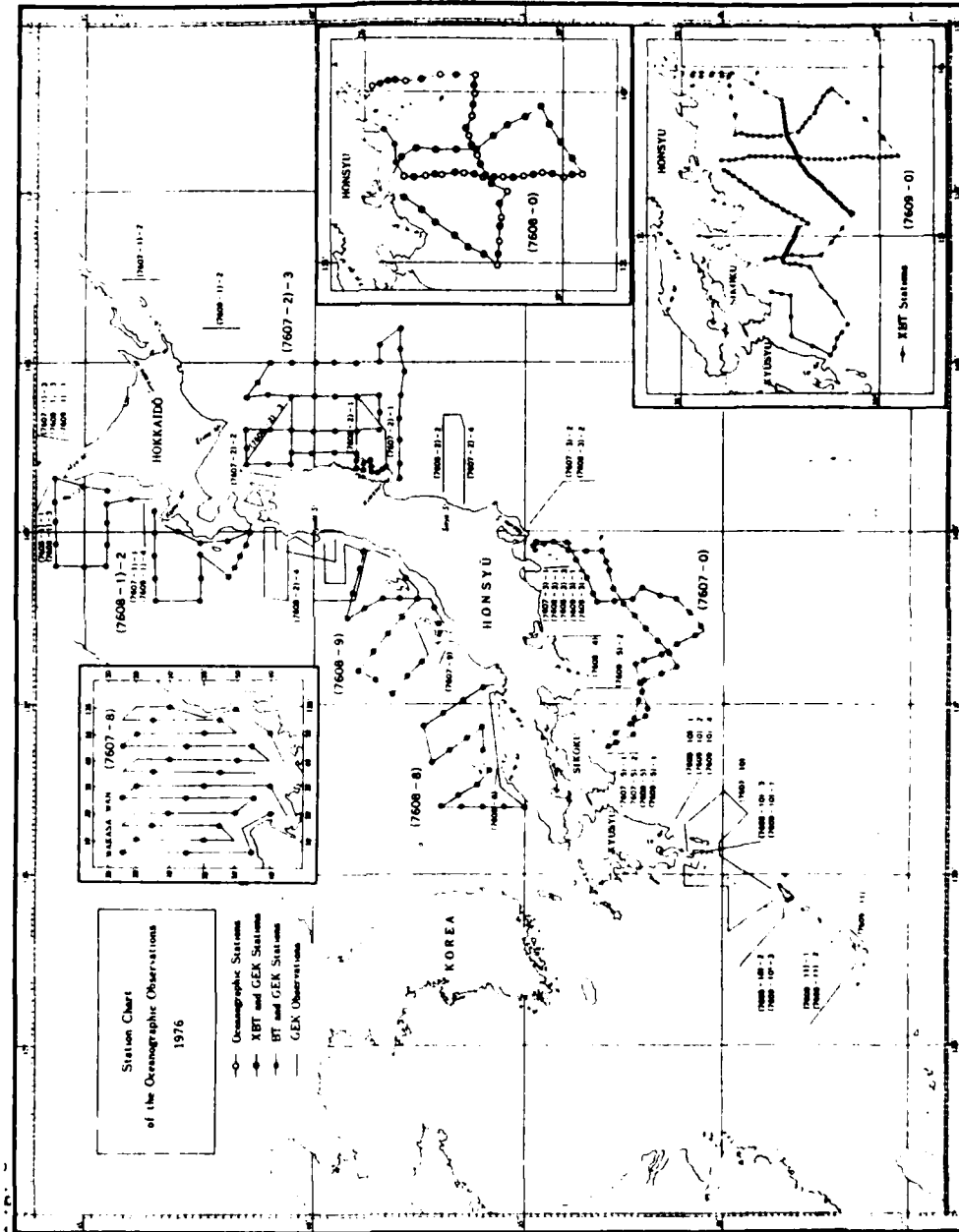
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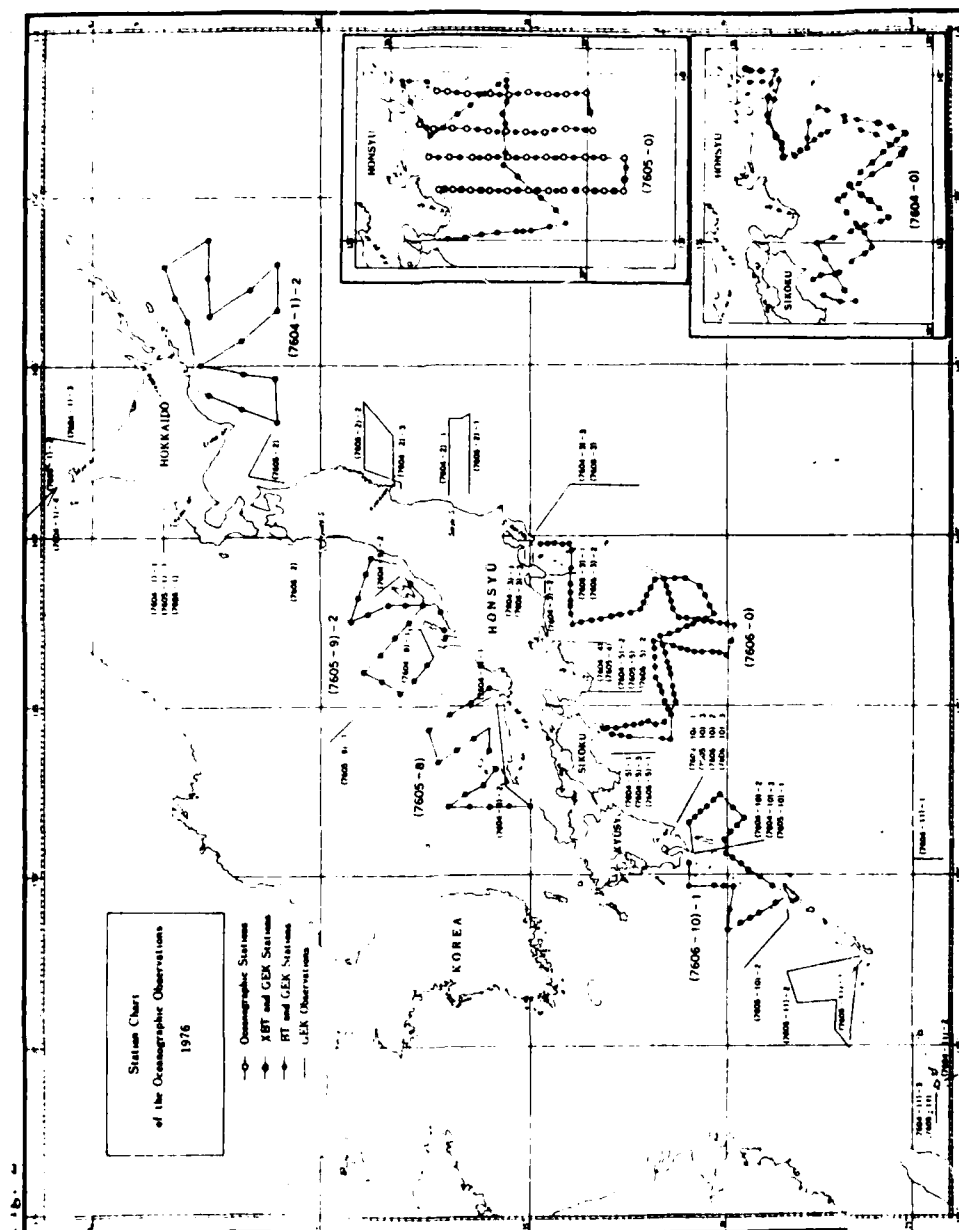
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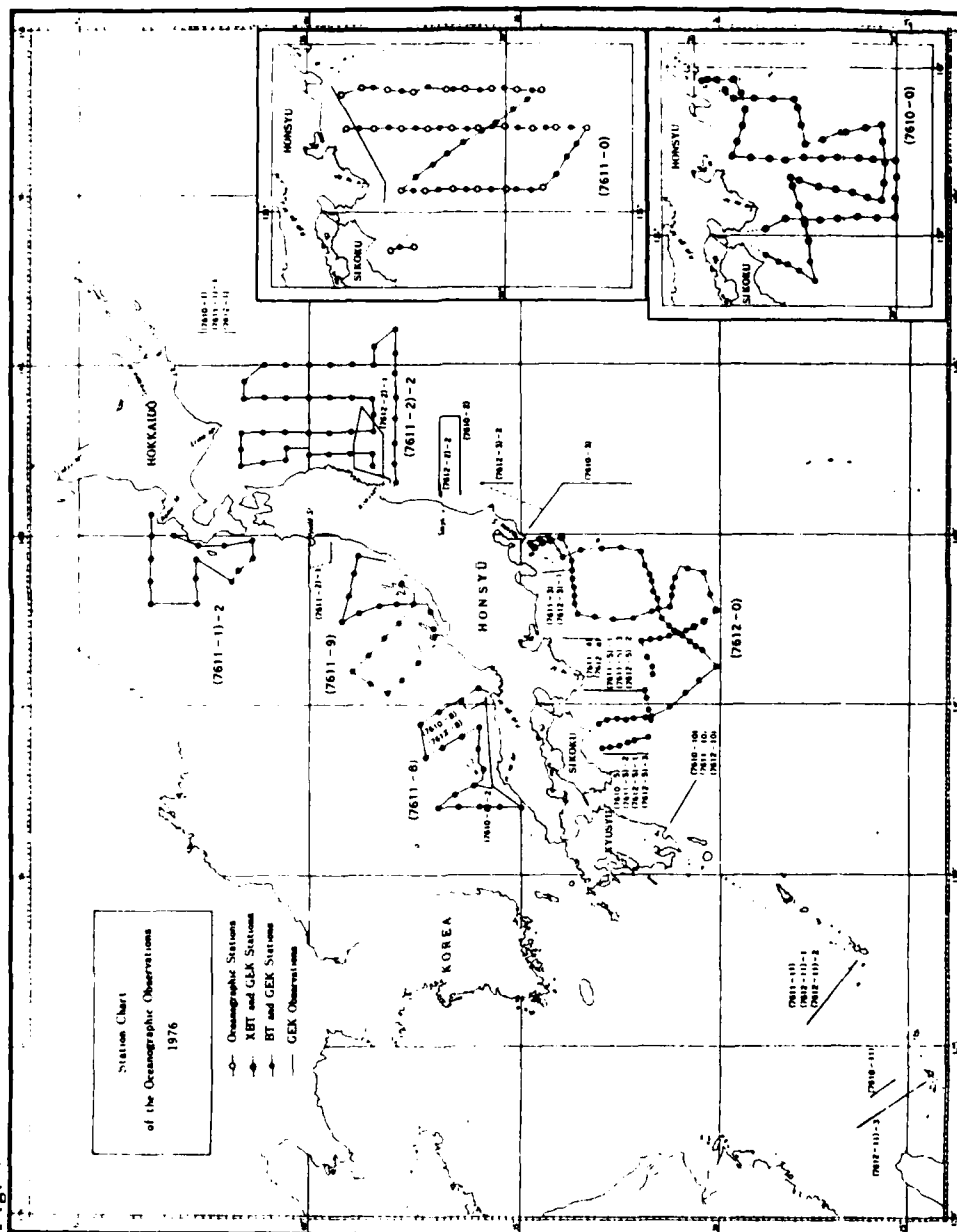
CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1976



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1976



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1976



CRUISE TRACKS BY JAPAN HYDROGRAPHIC OFFICE, YEAR 1976

APPENDIX 2

CRUISE TRACKS BY JAPAN FISHERIES AGENCY

APPENDIX 2

Cruise Tracks by Japan Fisheries Agency

Introduction

Included in this appendix are the serial oceanographic survey cruise tracks which have been occupied by the survey vessels of the Japan Fisheries Agency and its regional and prefectural affiliates. Also included are other pertinent information which, together with the cruise charts, will enable an investigator to quickly assess the extent of data available at a region of interest as well as the data reports in which such data can be accessed. For a complete tabulation of JFA cruise information on file with the NAVOCEANO OERS (Oceanographic Environmental Reference Service), see Table 3-2.

The Japan Fisheries Agency (called "Suisan-Cho" in Japanese) is a branch of Ministry of Agriculture, Forestry and Fishery. The Japan Fisheries Agency (JFA) was elevated to its present sub-ministry level in 1948, evolving from a previous departmental status as Bureau of Fisheries. At the same time, the previous "Fisheries Experiment Station" (or a pre-war "Imperial Fisheries Experiment Station") was expanded into a network of seven regional Fisheries Research Laboratories.

Table A2-1 shows jurisdictional division and head offices of these JFA regional Fisheries Research Laboratories.

In addition to the JFA organization of the central government, there are "Fisheries Experiment Stations" in all the coastal prefectures, some inland prefectures, municipalities and Hokkaido Province. (see Table A2-1) All of these JFA Research Laboratories and prefectural, municipal and provincial Experiment Stations engage in routine oceanographic cruises on scheduled basis.

Because of the diversity of data collectors affiliated with the JFA, it was only since 1966 that an effort to centralize the data reports into a consolidated publication took place. Since 1966, the data report has been published annually as:

"The Results of Fisheries Oceanographical
Observation"

In these data reports, the listing of data collected prior to 1963 is sketchy. The cruise charts included in this appendix date back to 1963. Information prior to 1963 must be referred to individual data collectors in the respective provinces.

TABLE A2-1: Principal agencies engaged in serial oceanographic observation

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN HYDROGRAPHIC OFFICE</u> Headquarters Region No. 1 No. 2 No. 3 No. 4 No. 5 No. 6 No. 7 No. 8 No. 9 No.10 No.11	Tokyo	-0	All waters.
	Otaru	-1	Tsugaru & Soya, both up- & down-stream.
	Shiogama	-2	Tsugaru, mainly downstream and off San-riku coasts.
	Yokohama	-3	Pacific Ocean.
	Nagoya	-4	Pacific Ocean.
	Kobe	-5	Pacific Ocean.
	Hiroshima	-6	Seto Inland Sea.
	Kitakyushu	-7	Tsushima, upstream on East China Sea.
	Maizuru	-8	Tsushima, downstream on Sea of Japan.
	Niigata	-9	Tsushima downstream and Tsugaru upstream, on Sea of Japan.
	Kagoshima	-10	Pacific Ocean & East China Sea.
<u>JAPAN FISHERIES AGENCY</u> Headquarters <u>Fisheries Research Laboratory</u> Hokkaido Tohoku Tokai Nankai Seikai Nihonkai Naikai	Naha	-11	Pacific Ocean & East China Sea.
	Tokyo		Administrative.
	Yoichi	FAH	Tsugaru & Soya, both up- & down-stream.
	Shiogama	FAT	Tsugaru, downstream on Pacific Ocean.
	Tokyo	-	Pacific Ocean.
	Kochi	-	Pacific Ocean.
	Nagasaki	FAS	Tsushima, upstream on East China Sea.
	Niigata	FAN	Tsushima, downstream on Sea of Japan.
	Hiroshima	-	Seto Inland Sea.

(TO CONTINUE)

TABLE A2-1: Principal agencies engaged in serial oceanographic observation
(Cont'd)

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN METEOROLOGICAL AGENCY</u>			
Headquarters	Tokyo		All waters.
<u>Marine Meteorolo- gical Observatory</u>			
Hakodate	Hakodate		Tsugaru & Soya, downstream on Pacific Ocean and Sea of Okhotsk.
Kobe	Kobe		Mainly, Pacific Ocean.
Nagasaki	Nagasaki		Tsushima, upstream on East China Sea.
Maizuru	Maizuru		Tsushima, downstream on Sea of Japan.
<u>PREFECTURAL FISHERIES EXPERIMENT STATIONS</u>			
Hakodate	Hakodate	FKH	Tsugaru, up- & down-stream. Soya upstream.
Wakkanai	Wakkanai	FKW	Soya, channel and downstream.
Abashiri	Abashiri	FKA	Soya, downstream.
Kushiro	Kushiro	FKK	Tsugaru, far downstream.
Chuo (Hokkaido)	Yoichi	FKC	All waters around Hokkaido.
Aomori	Nishi- Tsugaru	FKA	Tsugaru, up- and down-stream.
Nagasaki	Nagasaki	FKN	Tsushima, far upstream on East China Sea.
Saga	Karatsu	FKG	Tsushima, upstream on East China Sea.
Fukuoka	Fukuoka	FKF	Tsushima, immediately upstream and channel.
Yamaguchi	Nagato	FKY	Tsushima, channel and immediately down- stream on Sea of Japan.
Shimane	Hamada	FKS	Tsushima, far downstream.

(CONTINUED)

Unique to Japan, the nation's active interest in oceanography and oceanographic data collection has been strongly rooted in its concern over fishery productivity. As early as 1932 - 1937, Japanese fishery oceanographers undertook an ambitious "simultaneous oceanography survey" (Issei Chosa in Japanese) program in the Sea of Japan, Yellow Sea and East China Sea, employing its research vessel "Soyo Maru I" (220 gross ton, launched in 1925) along with some fifty small vessels from practically all the prefectural fisheries experiment stations facing the Sea of Japan. This program is considered the largest pre-war oceanographic survey program and an important milestone in the history of modern physical oceanography in Japan.

Traditionally, the amount of serial observational data collected by JFA and its affiliates altogether has outstripped that of the JHO and the JMA by a wide margin. For instance, the amount of serial oceanographic stations on file at Japan Oceanographic Data Center (JODC) as of 1979 was reported as follows:

<u>Agency</u>	<u>Data Period</u>	<u>No. of Stations</u>
JFA	1933 - 79	113,069
JMA	1947 - 79	61,426
JHO	1923 - 79	44,379
Universities	1935 - 75	7,144

Japanese fishery oceanographers account for almost a half of all the serial stations being occupied in Japan. On the other hand, the JFA's interest in GEK and BT measurements have been understandably low-keyed. A JODC tally of GEK stations between 1953 and 1970 shows the following result:

JHO	79,111	GEK Stations
JMA	37,021	GEK Stations
JFA	12,995	GEK Stations*

Note: (*) includes all the stations occupied by JFA affiliates.

JFA Cruises

Typical cruise tracks by the JFA and its regional, prefectural and provincial affiliates are shown in Figure A2-1. Codings employed to denote participating agencies are summarized in Table A2-1. Unique to the JFA station network are "simultaneous" surveys being undertaken routinely through coordination among various local affiliates.

Annotations

Cruise Number

The JFA cruise charts are organized into month/year for each sheet. The three-letter designations for the participating agencies have been entered in the cruise charts where their names appear for the first time each year. (See Table A2-1.)

Cruise Types

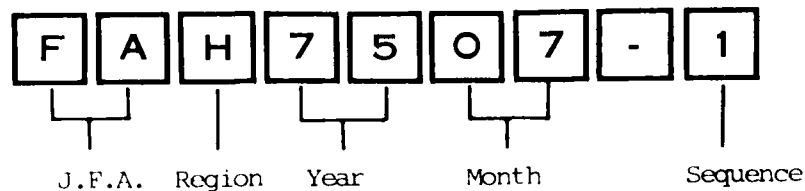
Majority of stations occupies by the JFA and its affiliates are dedicated for serial observations. Infrequent BT, XBT and GEK stations are annotated on the chart as necessary.

Data and Data Reports

Table A2-2 shows an example of serial data by the JFA. Table A2-3 summarizes the data reports thus far published by the JFA.

Data Search

The JFA cruise which is on file with NAVOCEANO's OERS (Oceanographic Environmental Reference Service) Cruise Inventory System is coded with a 7- or 8-digit coding. For instance, it may read like:



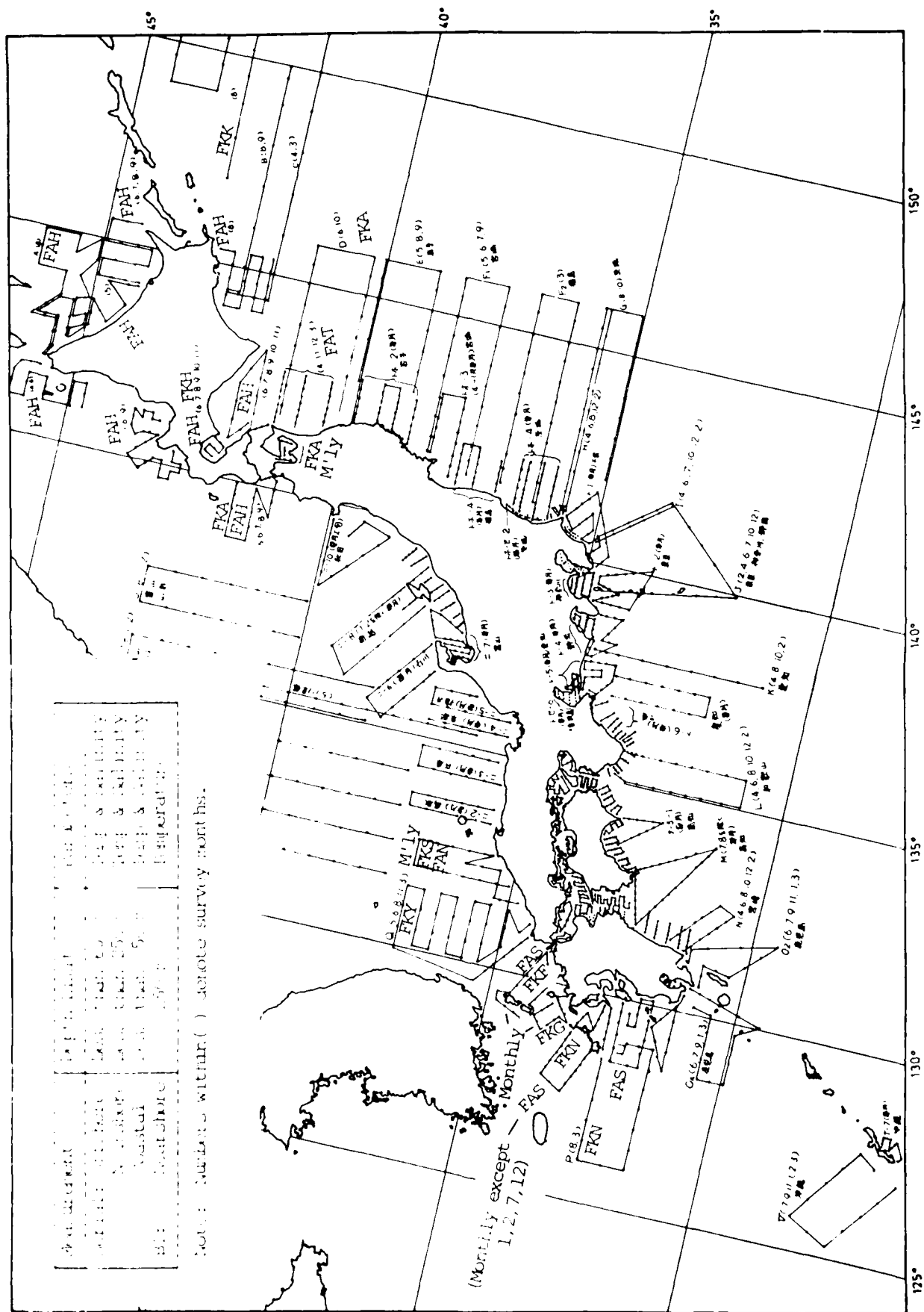


Figure A2-1. Typical Cruise Tracks by JFA.

TABLE A2-2. Sample Data of JFA Serial Observations.

OBSERVED					INTERPOLATED			OBSERVED					INTERPOLATED		
WIRE LENGTH	AN GLE	DEPTH	TEMP	SA.	DEPTH	TEMP	SA.	WIRE LENGTH	AN GLE	DEPTH	TEMP	SA.	DEPTH	TEMP	SA.
OKHOTSK SEA HOKKAIDO TANKAI MARU								75 75 13.8							
ST 6+ OCT. 5+73+LAT. 45-20 N+ LONG. 144-20 E+ TIME 13:05								OKHOTSK SEA HUKKAIDO TANKAI MARU							
DEPTH 850+ COLOR 5+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+								ST 12+ OCT. 6+73+LAT. 45-00 N+ LONG. 143-30 E+ TIME 08:27							
AIR TEMP. 11.0+ WEATHER BC+ CLOUD 4+ WIND W+H+3+								DEPTH 120+ COLOR 6+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+							
ATMOS. PRES. 1014.5+ PLANKTON NET TYPE KT+ MC+								AIR TEMP. 12.5+ WEATHER C+ CLOUD 8+ WIND W+H+3+							
ATMOS. PRES. 1014.5+ PLANKTON NET TYPE KT+ MC+								ATMOS. PRES. 1016.0+ PLANKTON NET TYPE KT+ MC+							
0	0	14.3	32.09		0	14.3	32.09	0	0	12.2	33.75		0	12.2	33.75
10	7	10	14.35	32.09	10	14.35	32.09	10	15	10	12.03	33.66	10	12.03	33.66
20		20	14.30	32.09	20	14.30	32.09	20		19	12.18	33.70	20	12.20	33.71
30		30	3.52	32.70	30	3.32	32.70	30		29	12.68	34.02	30	12.70	34.03
50		50	0.52	33.00	50	0.52	33.00	50		48	12.24	34.02	50	12.00	34.01
75		75	0.16	33.19	75	0.16	33.18	75		72	9.06	33.91	75	8.98	33.91
100		99	0.05	33.22	100	0.03	33.22	100		97	8.66	33.94	100	8.60	33.95
150	14	139	0.03	33.30	150	0.20	33.33								
200		190	0.45	33.38	200	0.43	33.39								
300		289	0.47	33.46	300	0.49	33.48								
400		389	0.33	33.57	400	0.83	33.58								
500		488	1.06	33.66											
OKHOTSK SEA HOKKAIDO TANKAI MARU								OKHOTSK SEA HUKKAIDO TANKAI MARU							
ST 7+ OCT. 5+73+LAT. 45-20 N+ LONG. 144-00 E+ TIME 16:10								ST 13+ OCT. 6+73+LAT. 45-00 N+ LONG. 143-30 E+ TIME 11:16							
DEPTH 840+ COLOR 6+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+								DEPTH 155+ COLOR 6+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+							
AIR TEMP. 10.5+ WEATHER BC+ CLOUD 3+ WIND W+H+3+								AIR TEMP. 13.2+ WEATHER C+ CLOUD 3+ WIND W+H+3+							
ATMOS. PRES. 1015.0+ PLANKTON NET TYPE KT+ MC+								ATMOS. PRES. 1015.5+ PLANKTON NET TYPE KT+ MC+							
0	0	13.4	31.73		0	13.4	31.73	0	0	14.6	31.79		0	14.6	31.79
10	18	10	13.72	31.75	10	13.72	31.75	10	4	10	14.53	31.78	10	14.53	31.78
20		19	13.70	31.77	20	13.69	31.77	20		20	14.11	31.81	20	14.11	31.81
30		29	2.08	32.38	30	2.00	32.42	30		30	2.84	32.24	30	2.84	32.24
50		48	0.78	32.38	50	0.80	32.90	50		50	4.61	33.19	50	4.61	33.19
75		71	0.50	32.98	75	0.45	33.03	75		75	0.66	33.12	75	0.66	33.12
100		95	0.37	33.23	100	0.08	33.25	100		100	0.11	33.22	100	0.11	33.22
150		143	0.31	33.28	150	0.02	33.28	150		150	0.77	33.40	150	0.77	33.40
200	24	188	0.14	33.32	200	0.20	33.34								
300		282	0.64	33.46	300	0.72	33.49								
400		352	0.89	33.55	400	0.84	33.59								
500		440	0.78	33.61											
OKHOTSK SEA HOKKAIDO TANKAI MARU								OKHOTSK SEA HUKKAIDO TANKAI MARU							
ST 8+ OCT. 5+73+LAT. 45-20 N+ LONG. 143-30 E+ TIME 22:10								ST 14+ OCT. 6+73+LAT. 45-00 N+ LONG. 144-00 E+ TIME 16:07							
DEPTH 158+ COLOR 5+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+								DEPTH 215+ COLOR 5+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+							
AIR TEMP. 10.4+ WEATHER BC+ CLOUD 2+ WIND W+H+3+								AIR TEMP. 12.2+ WEATHER C+ CLOUD 7+ WIND W+H+3+							
ATMOS. PRES. 1017.0+ PLANKTON NET TYPE KT+ MC+								ATMOS. PRES. 1014.0+ PLANKTON NET TYPE KT+ MC+							
0	0	14.1	31.76		0	14.1	31.76	0	0	13.8	31.62		0	13.8	31.62
10	27	9	14.33	31.73	10	14.33	31.73	10	14	9	13.83	31.64	10	13.83	31.64
20		16	14.28	31.74	20	14.20	31.76	20		19	13.75	31.64	20	13.65	31.64
30		27	12.30	32.19	30	8.95	32.29	30		28	3.59	32.71	30	4.05	32.77
50		43	1.69	32.49	50	1.37	32.59	50		46	0.77	32.97	50	0.30	33.00
75		67	1.11	33.12	75	1.04	33.20	75		70	0.42	33.15	75	0.52	33.16
100		89	0.72	33.26	100	0.39	33.28	100		92	0.70	33.18	100	0.70	33.19
150		134	0.05	33.32				150		140	0.46	33.27	150	0.42	33.29
								200		188	0.28	33.33			
OKHOTSK SEA HOKKAIDO TANKAI MARU								OKHOTSK SEA HUKKAIDO TANKAI MARU							
ST 9+ OCT. 6+73+LAT. 45-20 N+ LONG. 143-00 E+ TIME 01:35								ST 15+ OCT. 6+73+LAT. 44-45 N+ LONG. 144-00 E+ TIME 16:24							
DEPTH 120+ COLOR 5+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+								DEPTH 180+ COLOR 5+ TRANSP. WAVE H+H+ S+ SHELL W+H+3+							
AIR TEMP. 12.3+ WEATHER C+ CLOUD 4+ WIND W+H+3+								AIR TEMP. 12.5+ WEATHER BC+ CLOUD 4+ WIND W+H+3+							
ATMOS. PRES. 1016.0+ PLANKTON NET TYPE KT+ MC+								ATMOS. PRES. 1014.5+ PLANKTON NET TYPE KT+ MC+							
0	0	12.6	31.81		0	12.6	31.81	0	0	14.5	31.85		0	14.5	31.85
10	17	10	12.67	31.81	10	12.67	31.81	10	14	10	14.54	31.84	10	14.54	31.84
20		19	7.93	32.11	20	7.75	32.15	20		19	14.48	31.84	20	7.30	32.85
30		29	7.34	32.27	30	7.26	32.28	30		29	7.49	32.80	30	4.90	33.31
50		48	0.77	33.05	50	0.77	33.05	50		49	5.30	33.31	50	1.43	33.11
								75		75	1.38	33.11	75	1.39	33.32
								100		97	1.36	33.30	100	1.39	33.32
								150		146	1.11	33.41			
OKHOTSK SEA HOKKAIDO TANKAI MARU								OKHOTSK SEA HUKKAIDO TANKAI MARU							

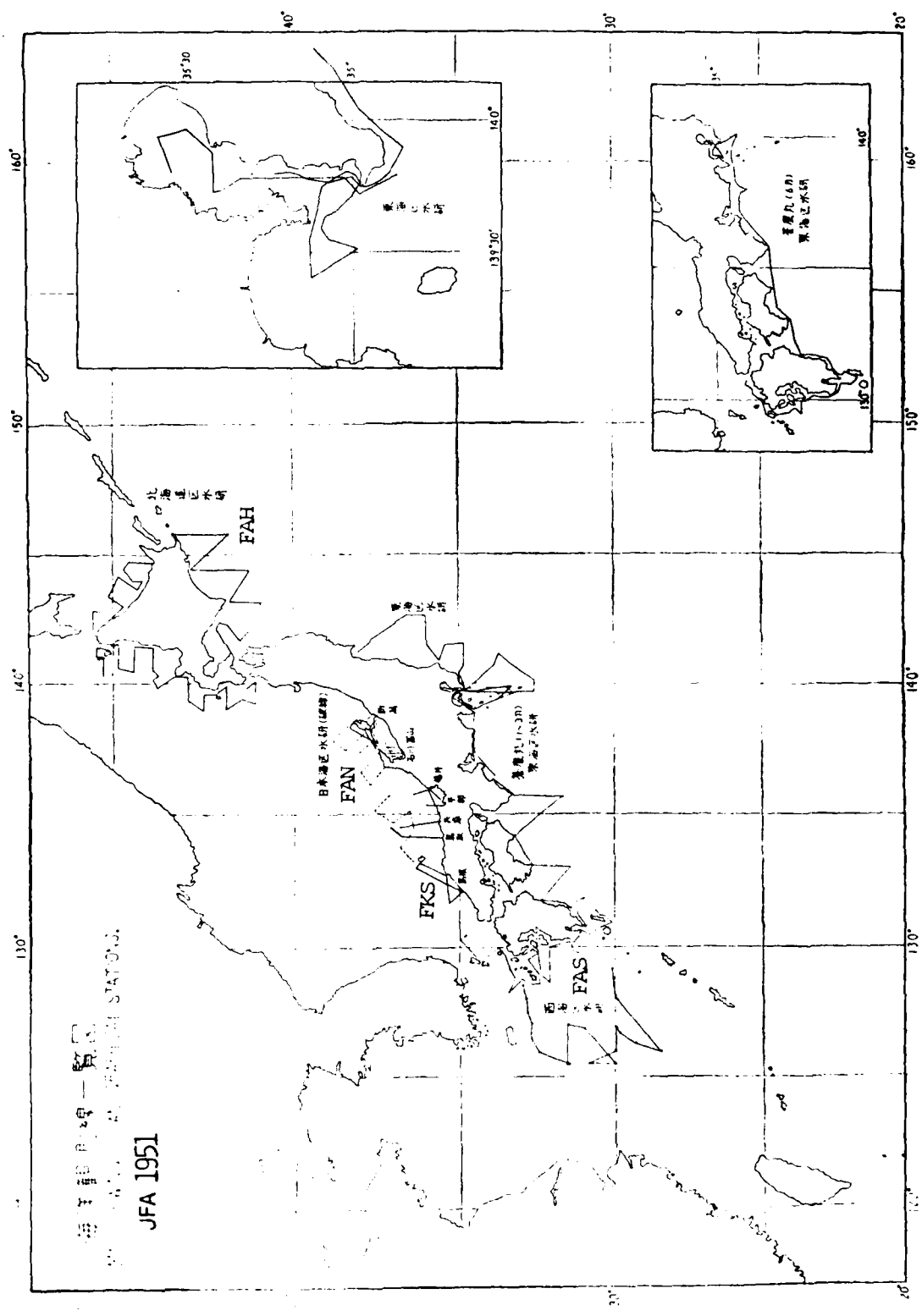
TABLE A2-3. Published Issues of JFA Data Reports: "The Results of Fisheries Oceanographical Observation."

DATA YEAR	REPORT YEAR
1951	1969
1952	1970
1963	1966
1964	1967
1965	1968
1966	1969
1967	1970
1968	1971
1969	1972
1970	1973
1971	1974
1972	1976
1973	1978
1974	1979
1975	1980

The coding always starts with a letter "F" denoting "Fishery", which is followed by either "A" denoting Fisheries Research Laboratory under Fisheries Agency, or "K" denoting prefectural ("Ken" in Japanese) or provincial (such as Hokkaido) Fisheries Experiment Station. The third character relates to particular region; namely, an "F" for Fukuoka Prefecture, an "A" for Aomori Prefecture, a "W" for Wakkanai Area, etc. Immediately following these three alphabetical letters are four-digit numerals consisting of the first two digits denoting the year of data collection and the second two digits denoting the month. Whenever repeat cruises were conducted by the same agency during the same month of the year, a one-digit sequence code is added after a hyphen.

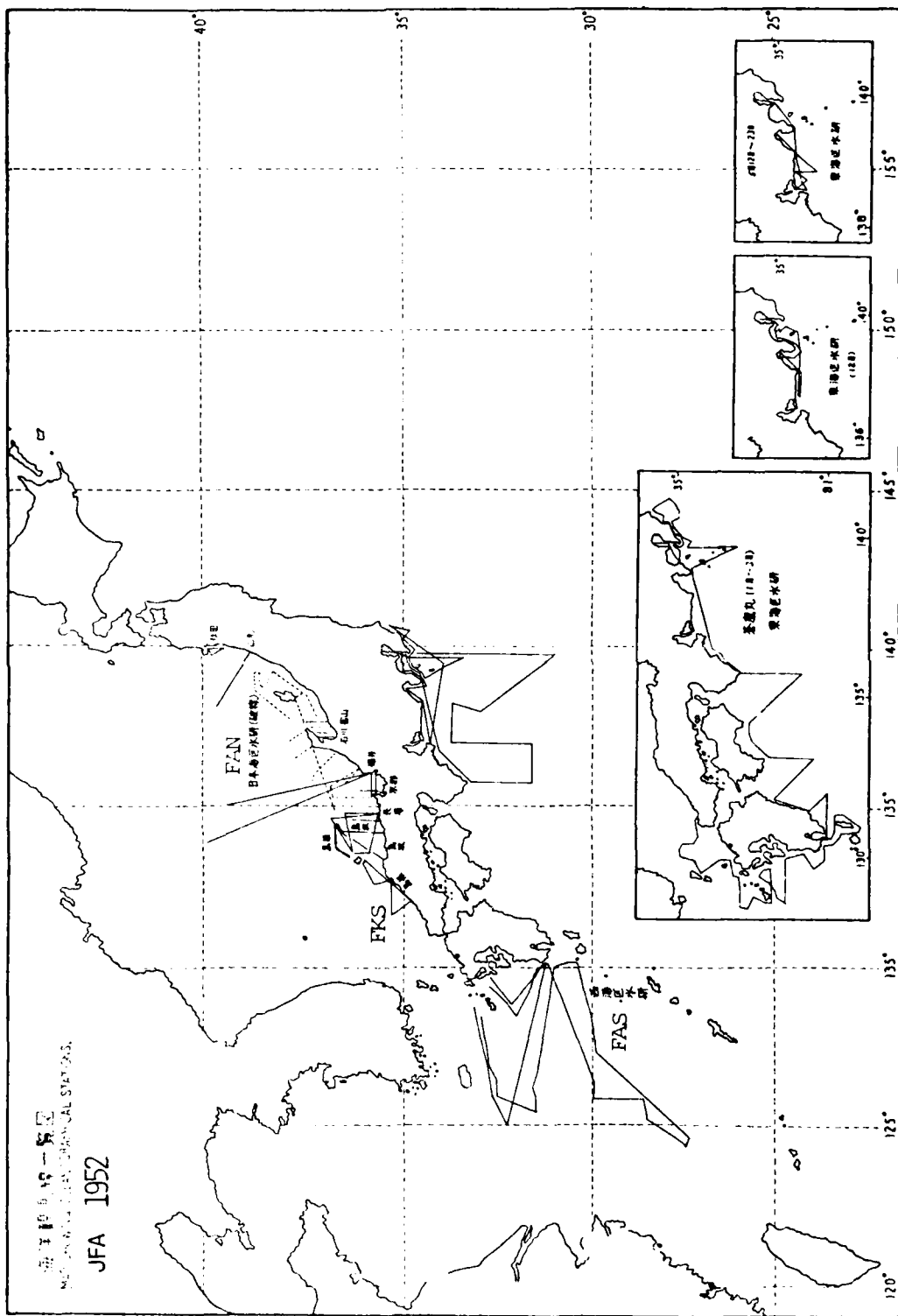
Thus, a coding FAH7507-1, as shown, means Fisheries data taken by Fisheries Agency's Fisheries Research Laboratory in Hokkaido during the month of July, 1975, on its first cruise of the month.

To aid in the search of data in the data reports, the data report listing in Table A2-3 may be used. Once the year of data collection at a location of interest is identified, Table A2-3 provides the year of data report publication. Each data report carries cruise charts and a table of contents designating the page location of the data.

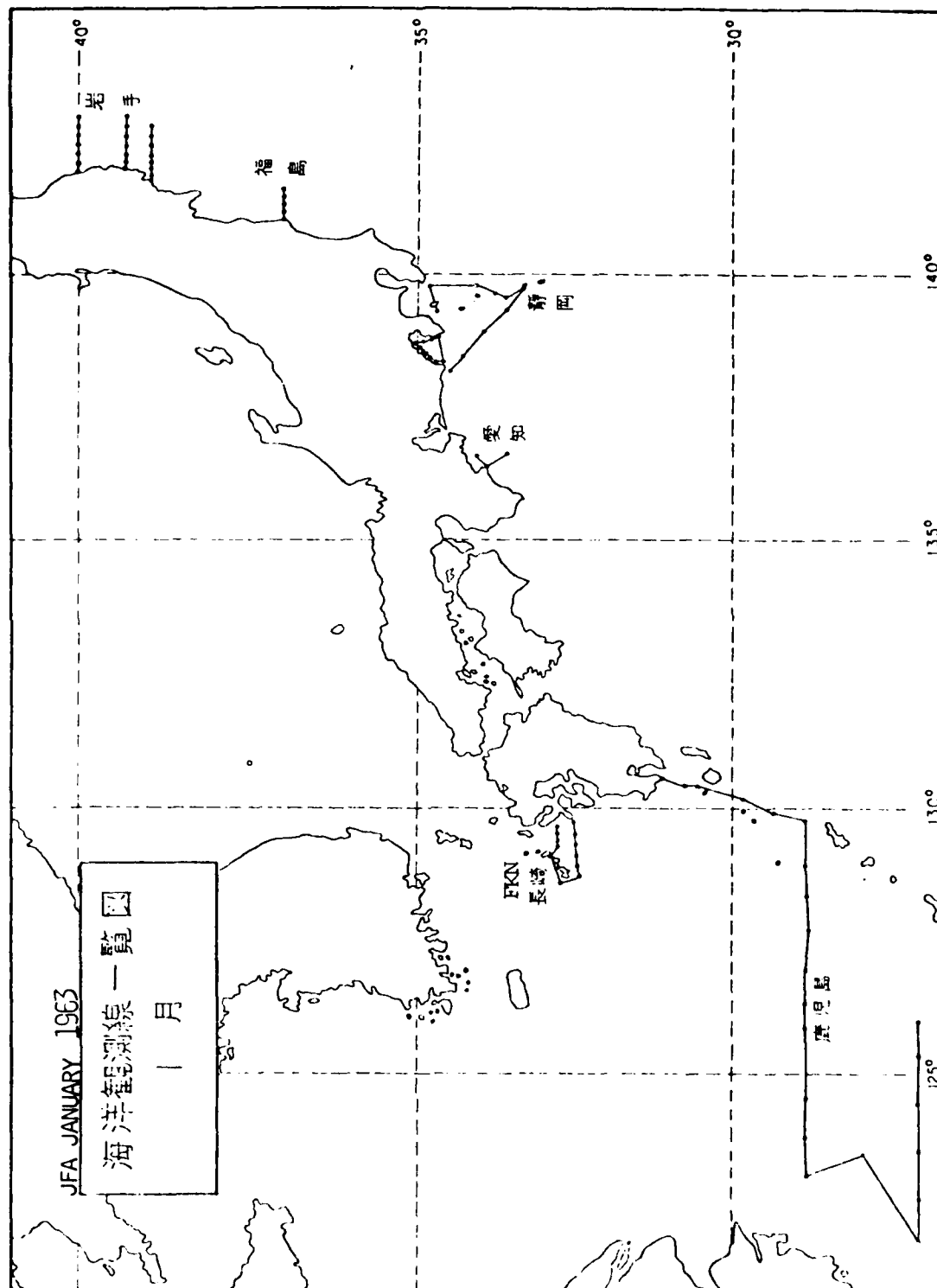


日本漁業調査船一覽
 JFA 1951

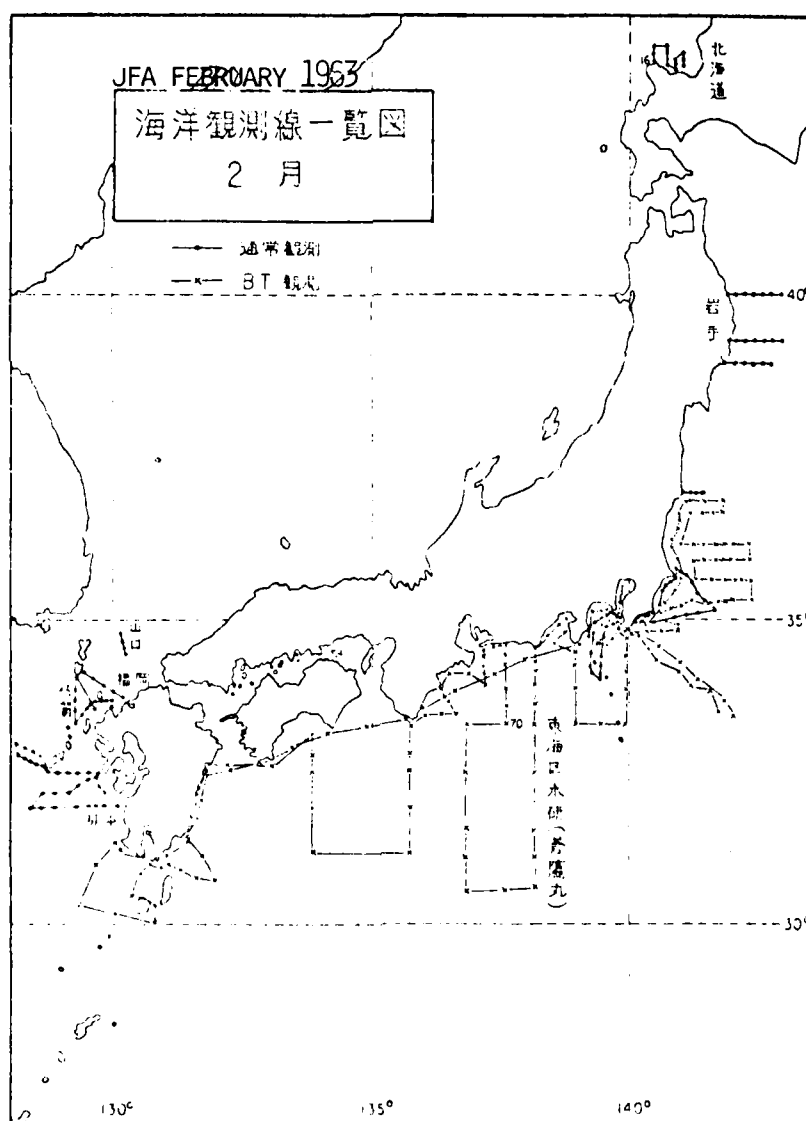
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1951



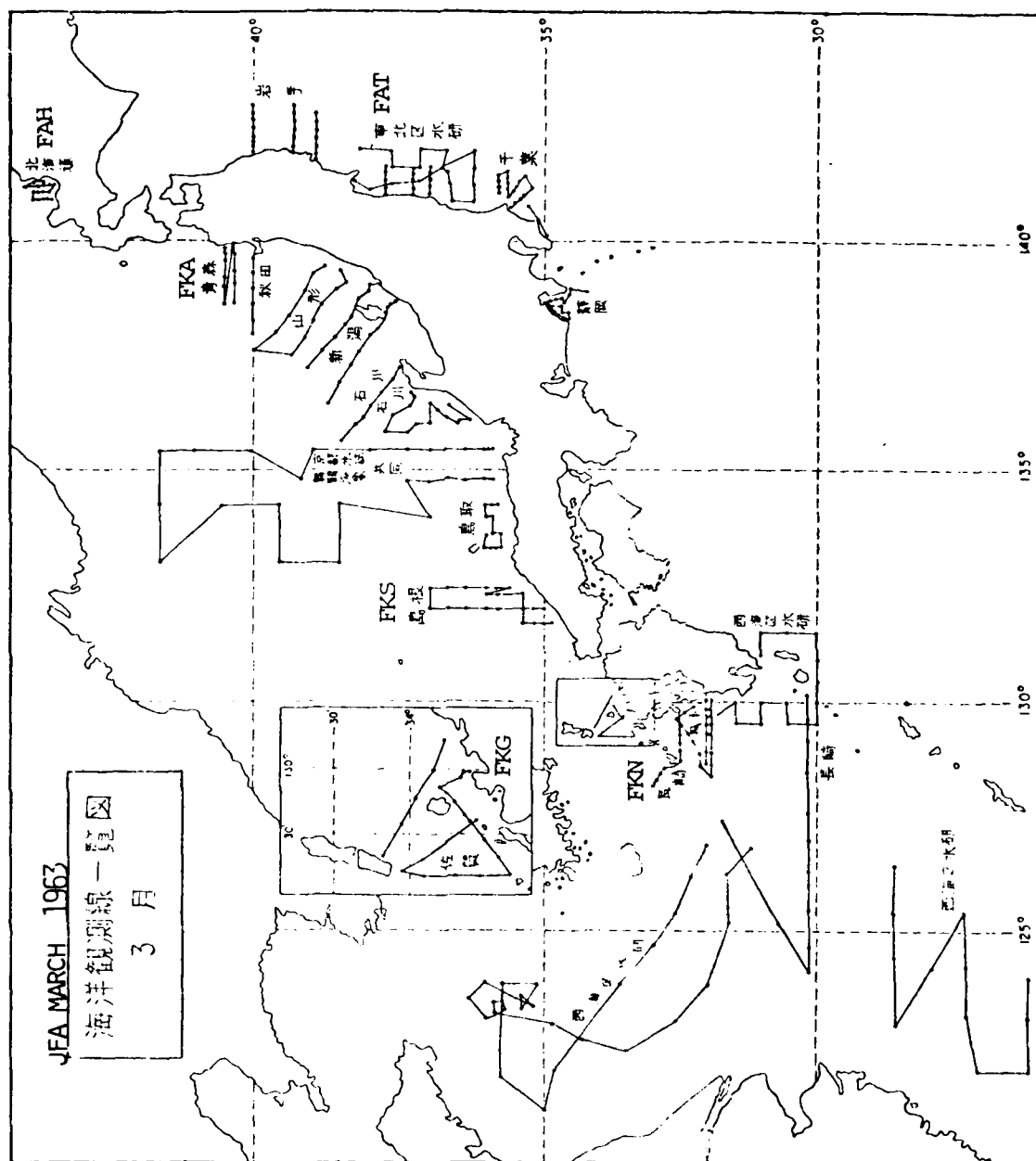
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1952

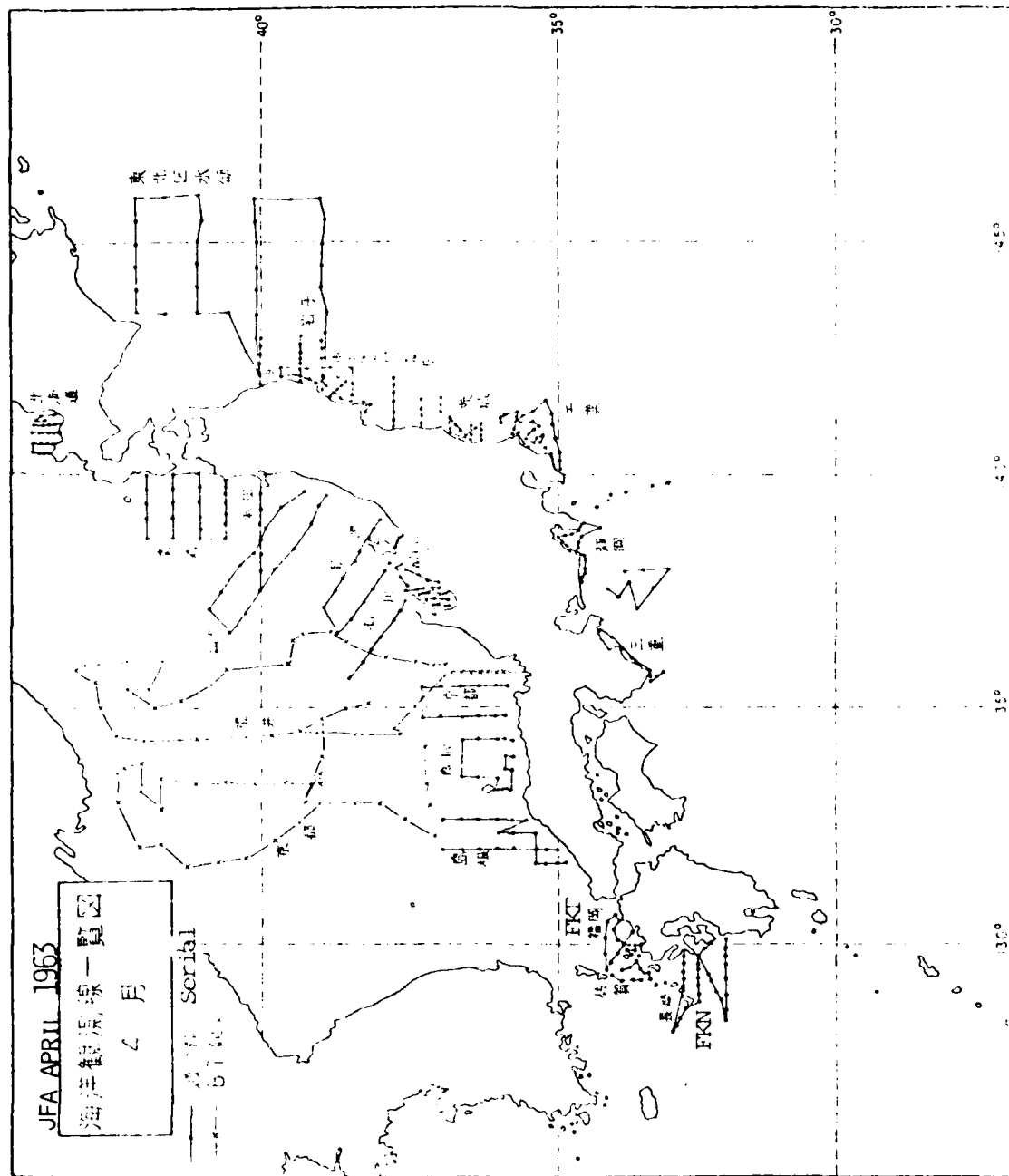


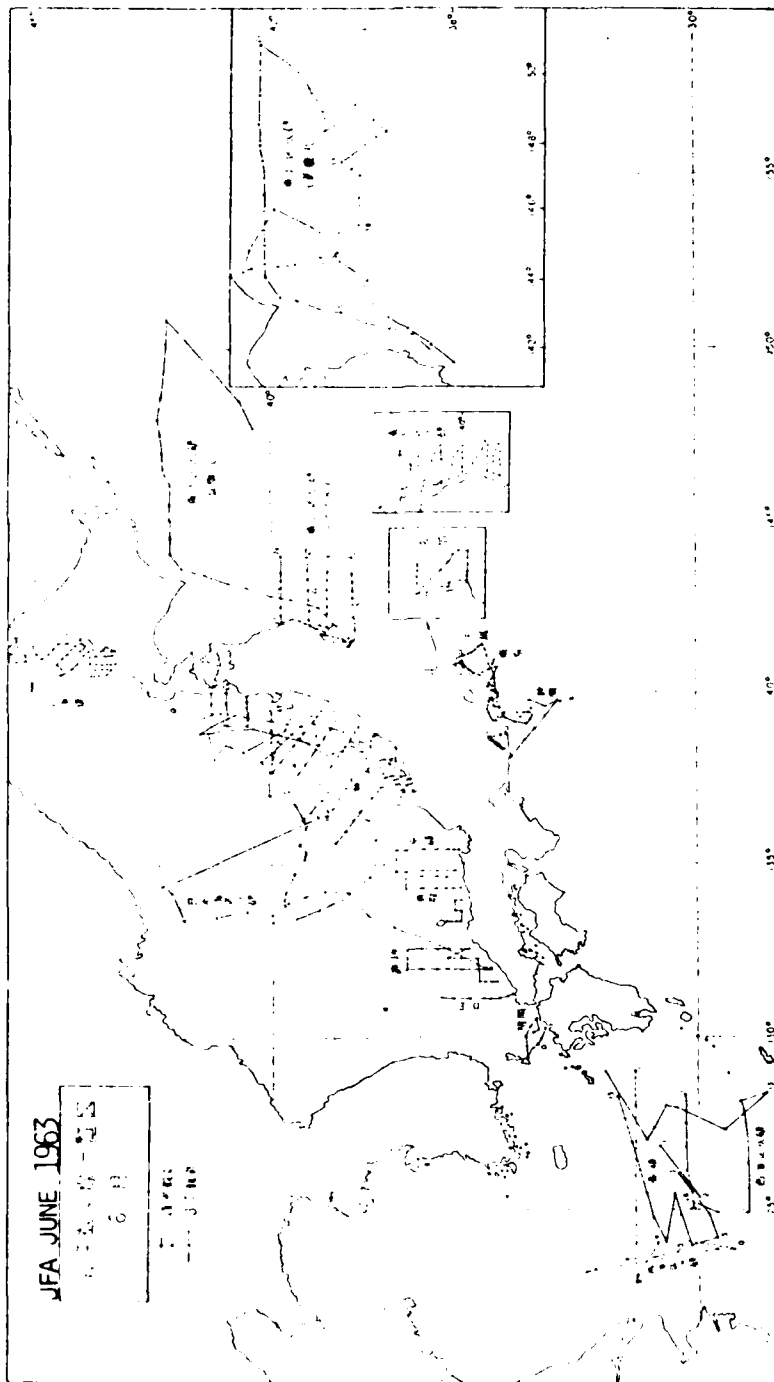
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963



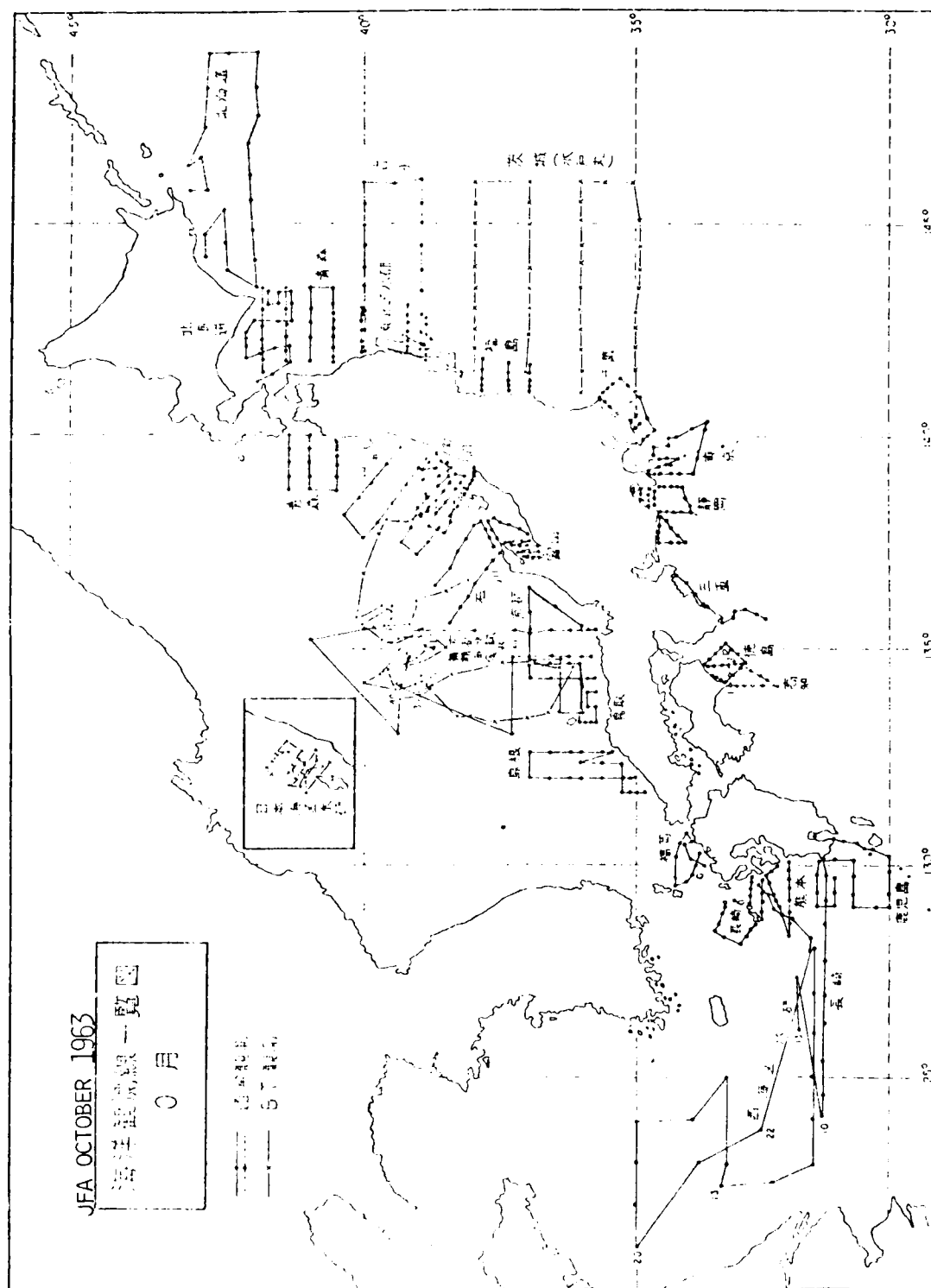
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963

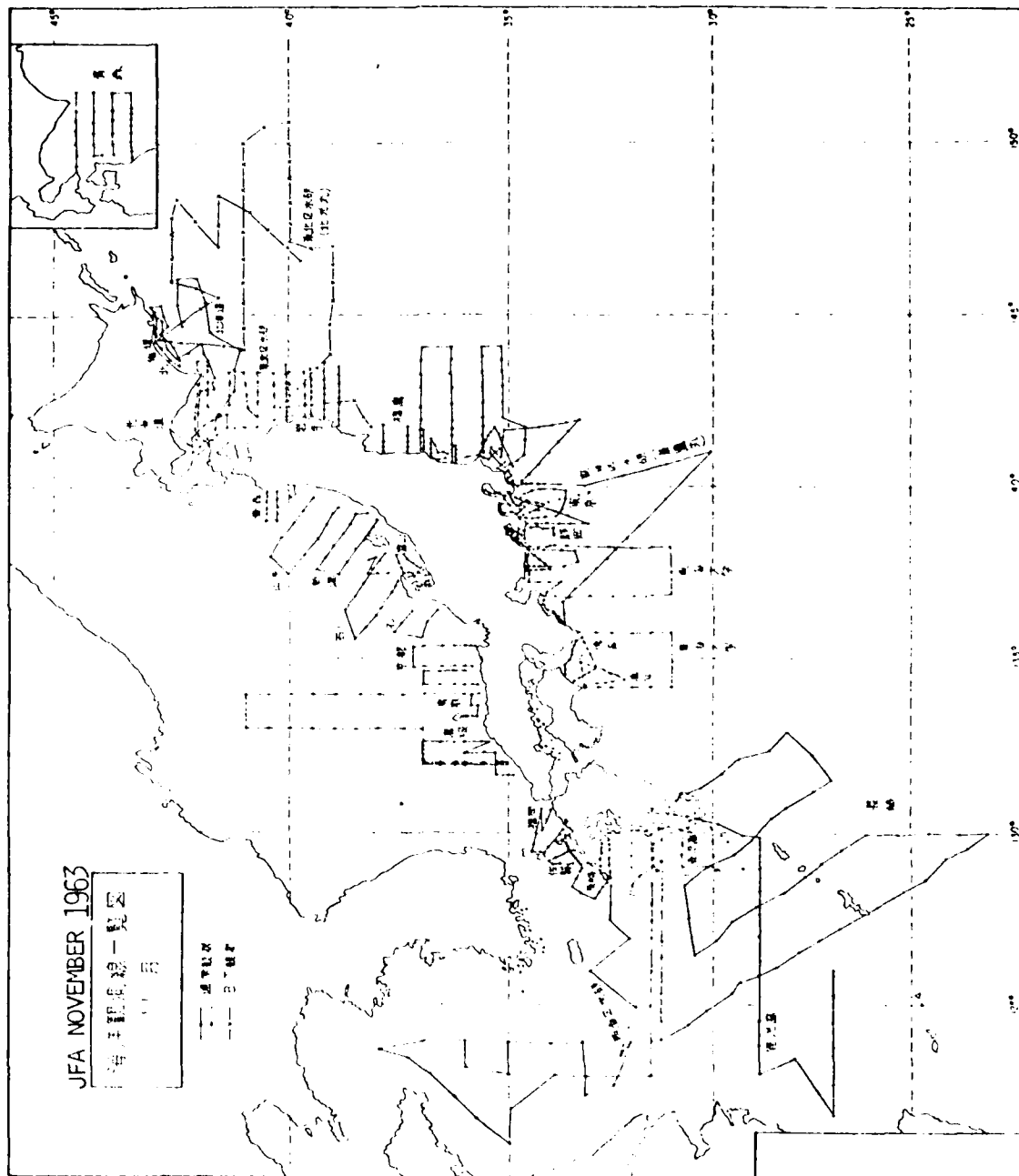
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963



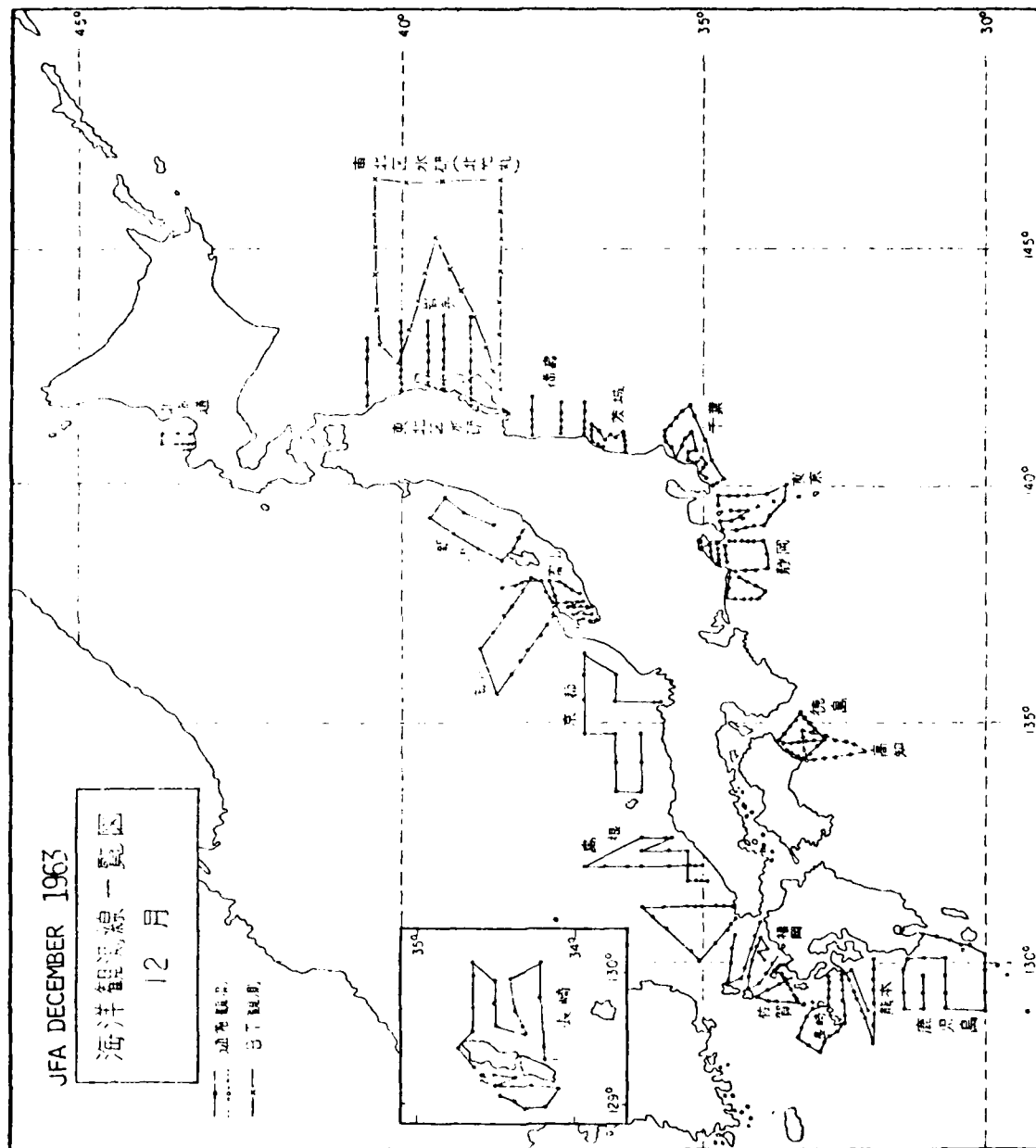
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963



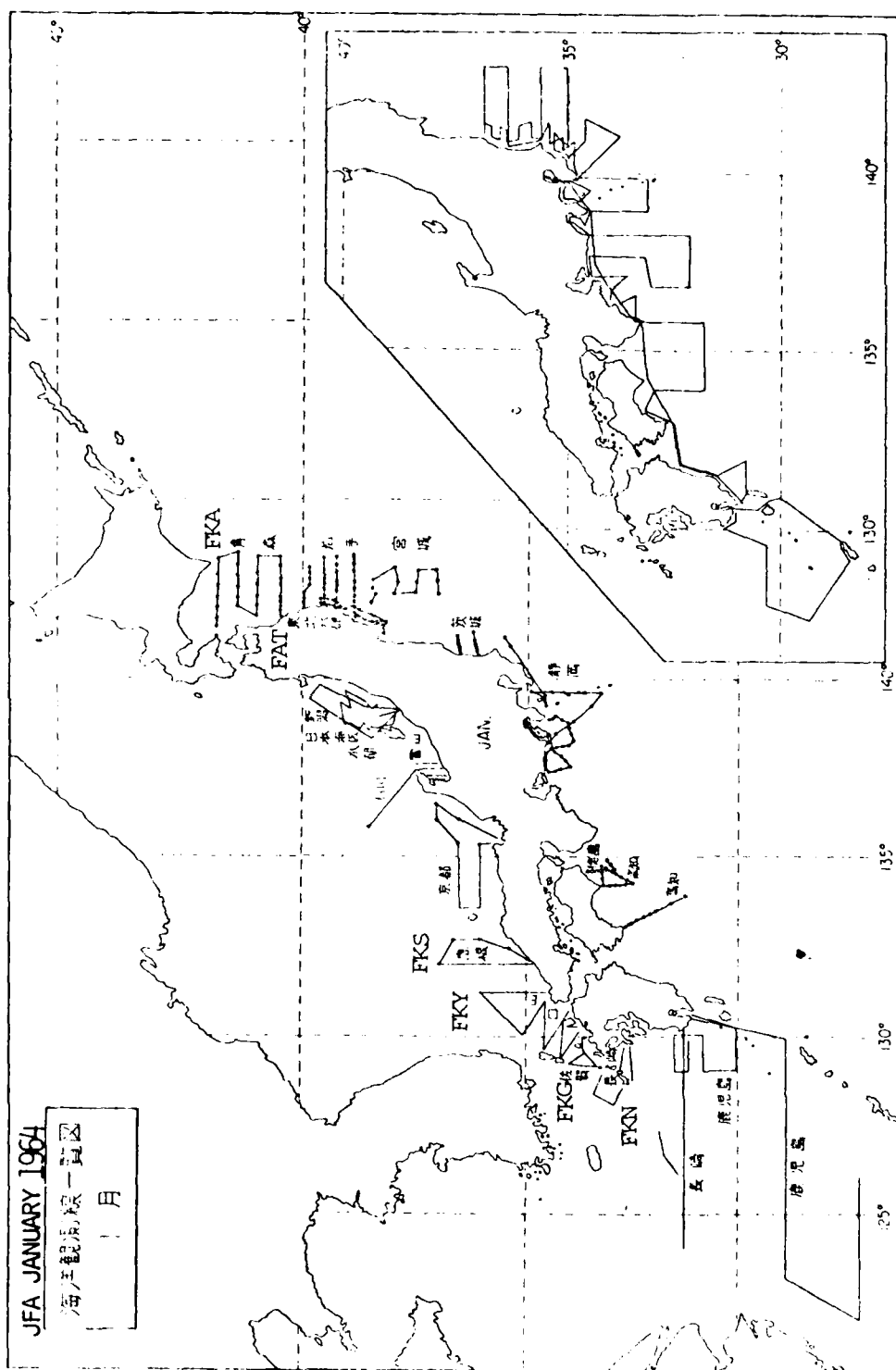
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963



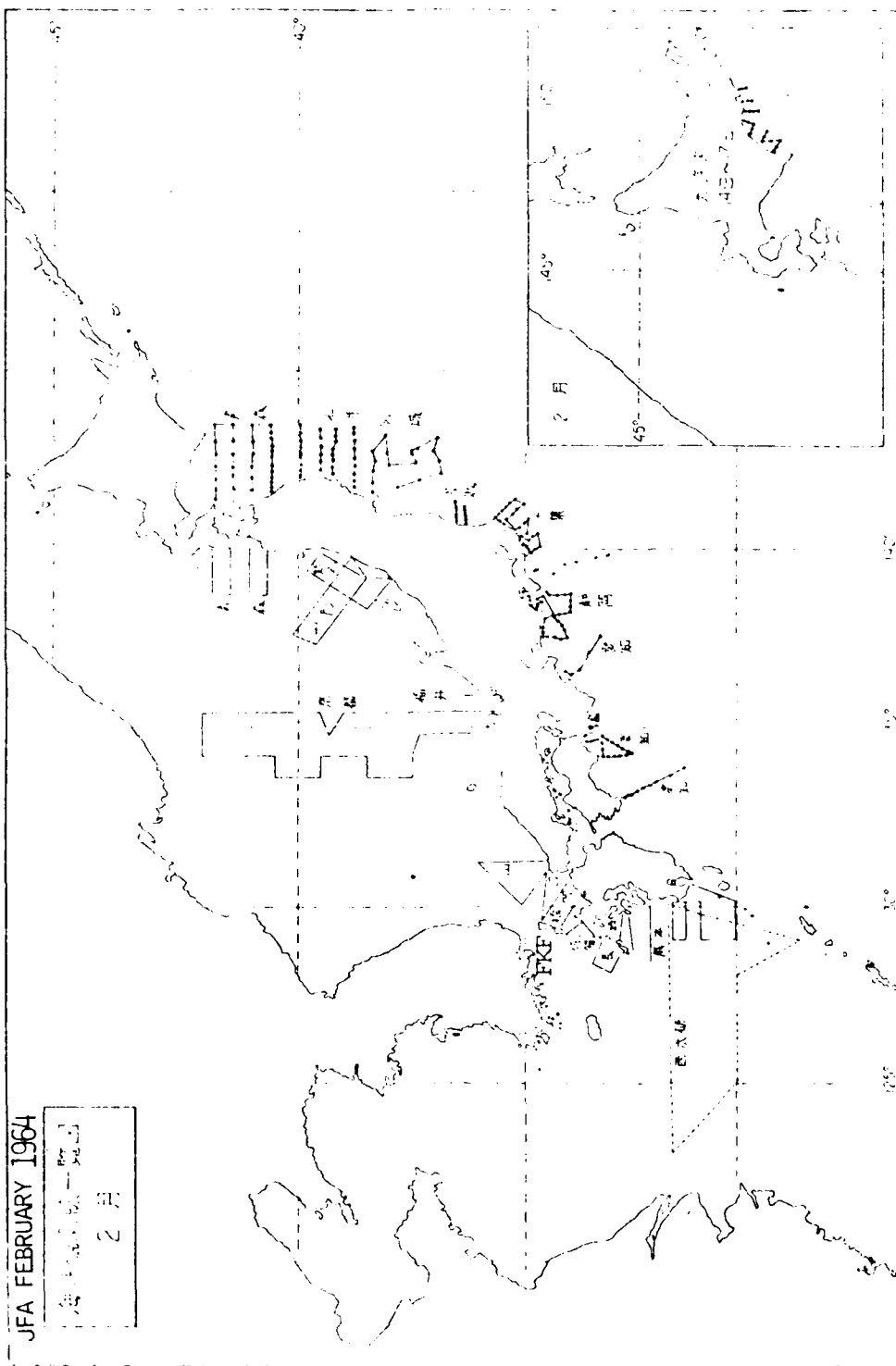
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1963



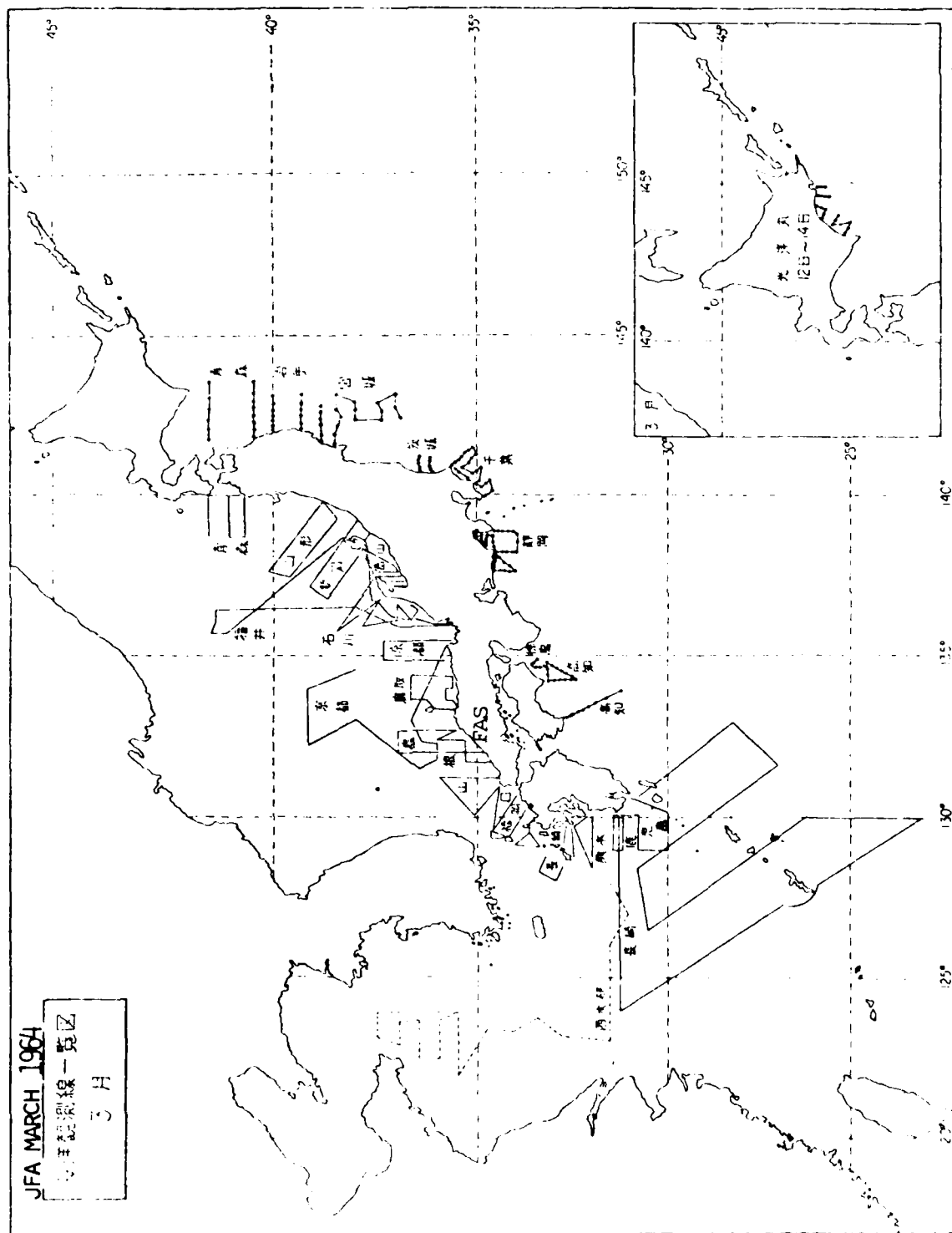
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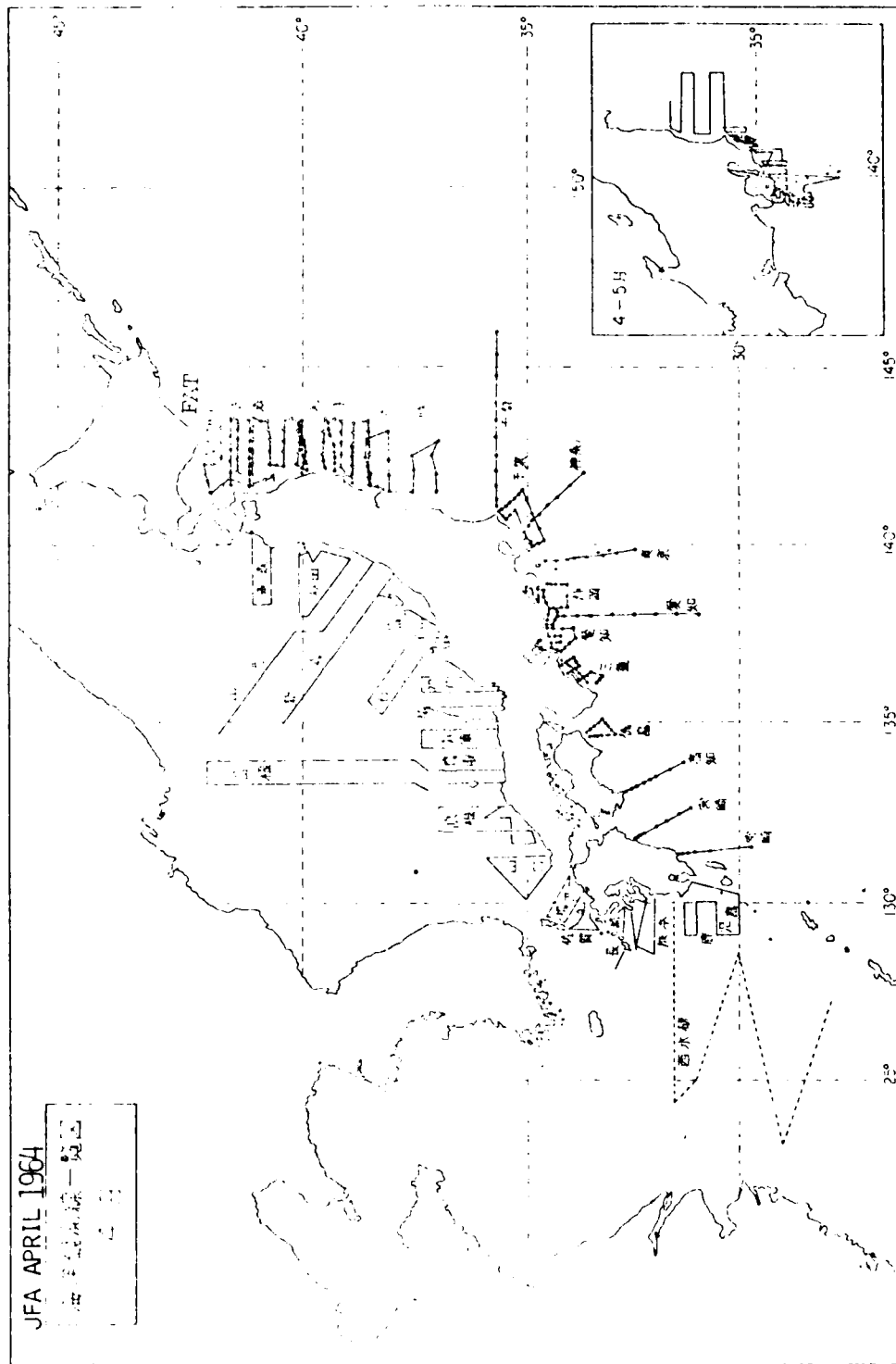
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1964

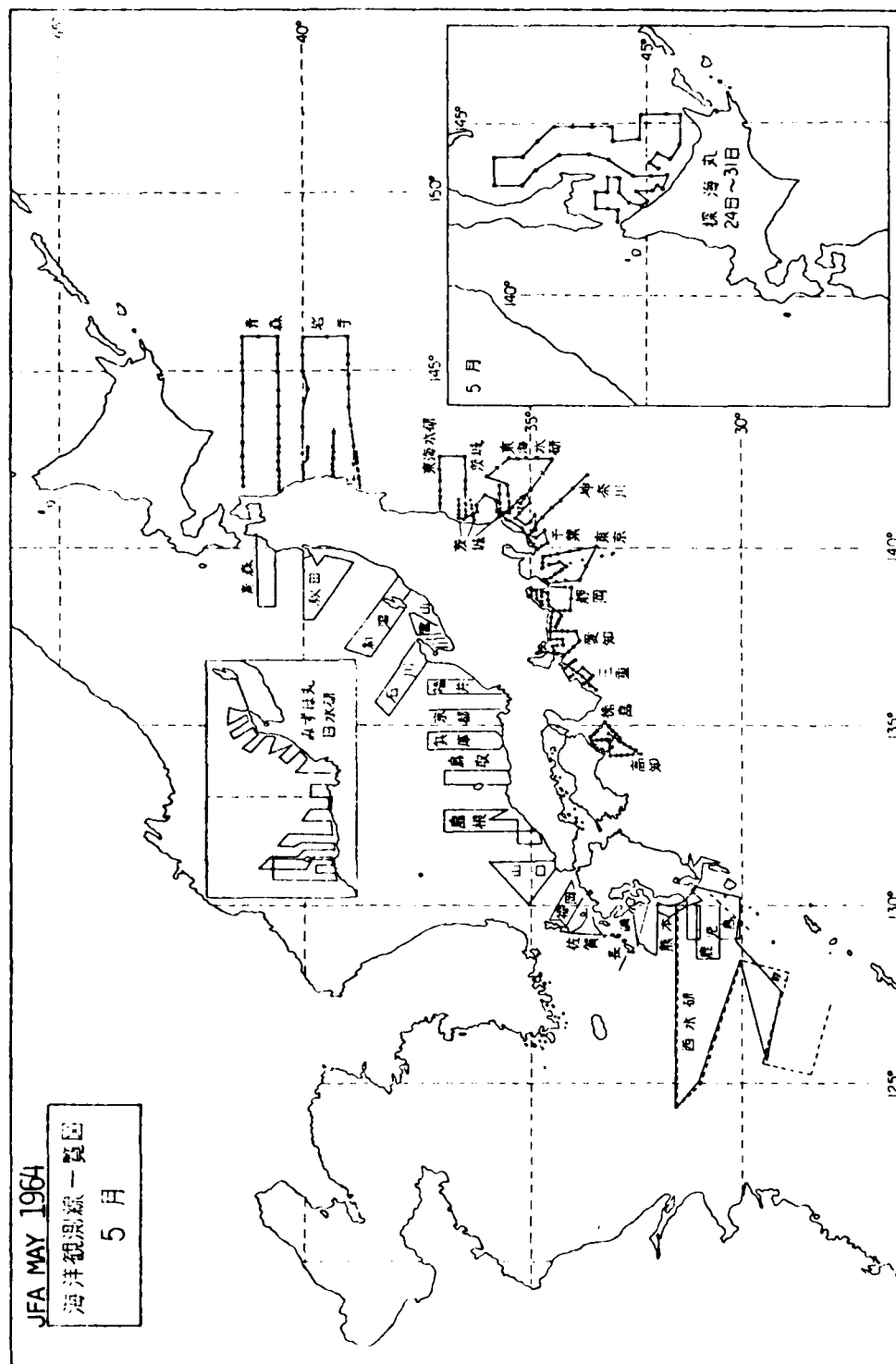


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1964

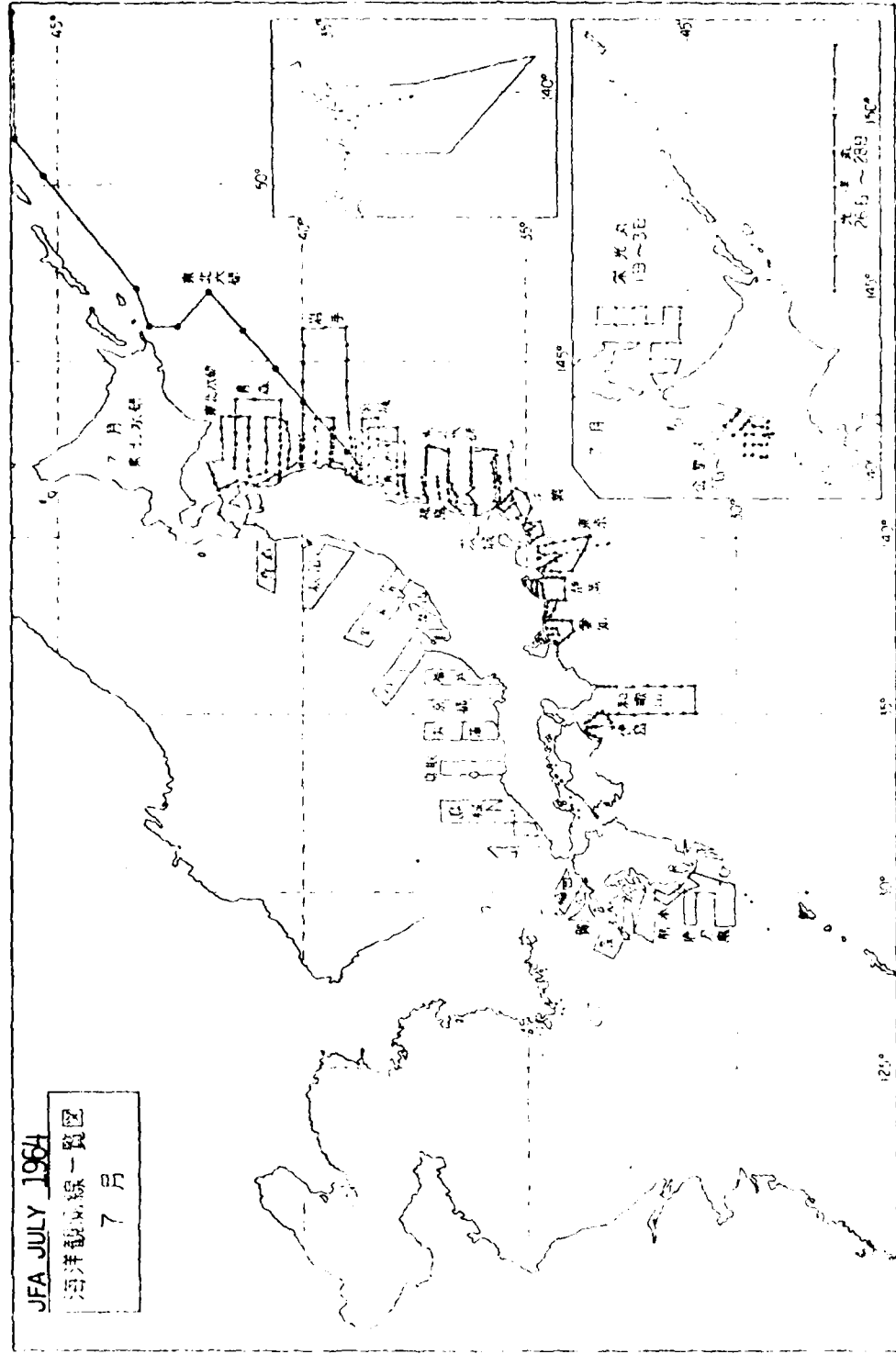


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1964

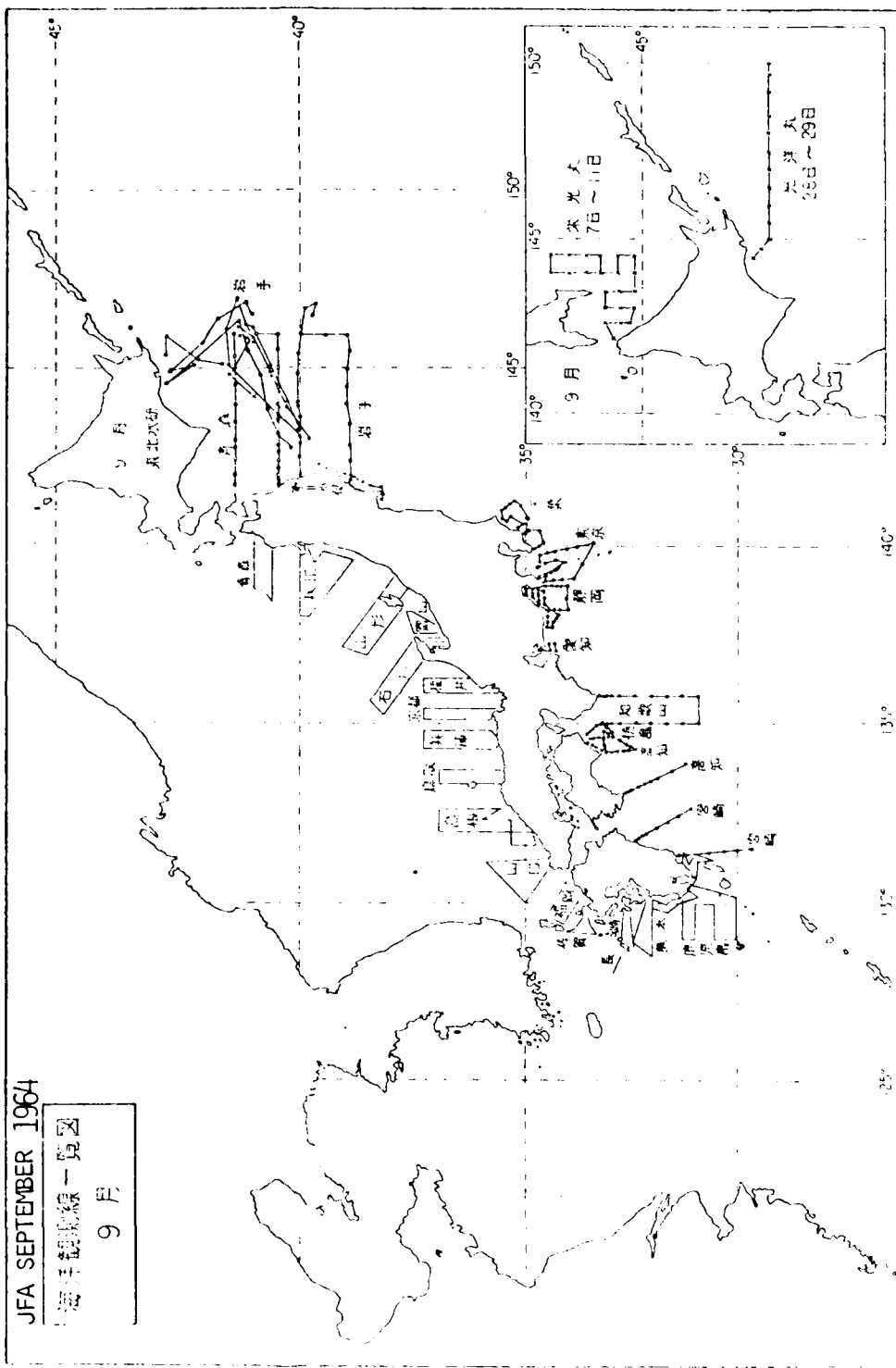


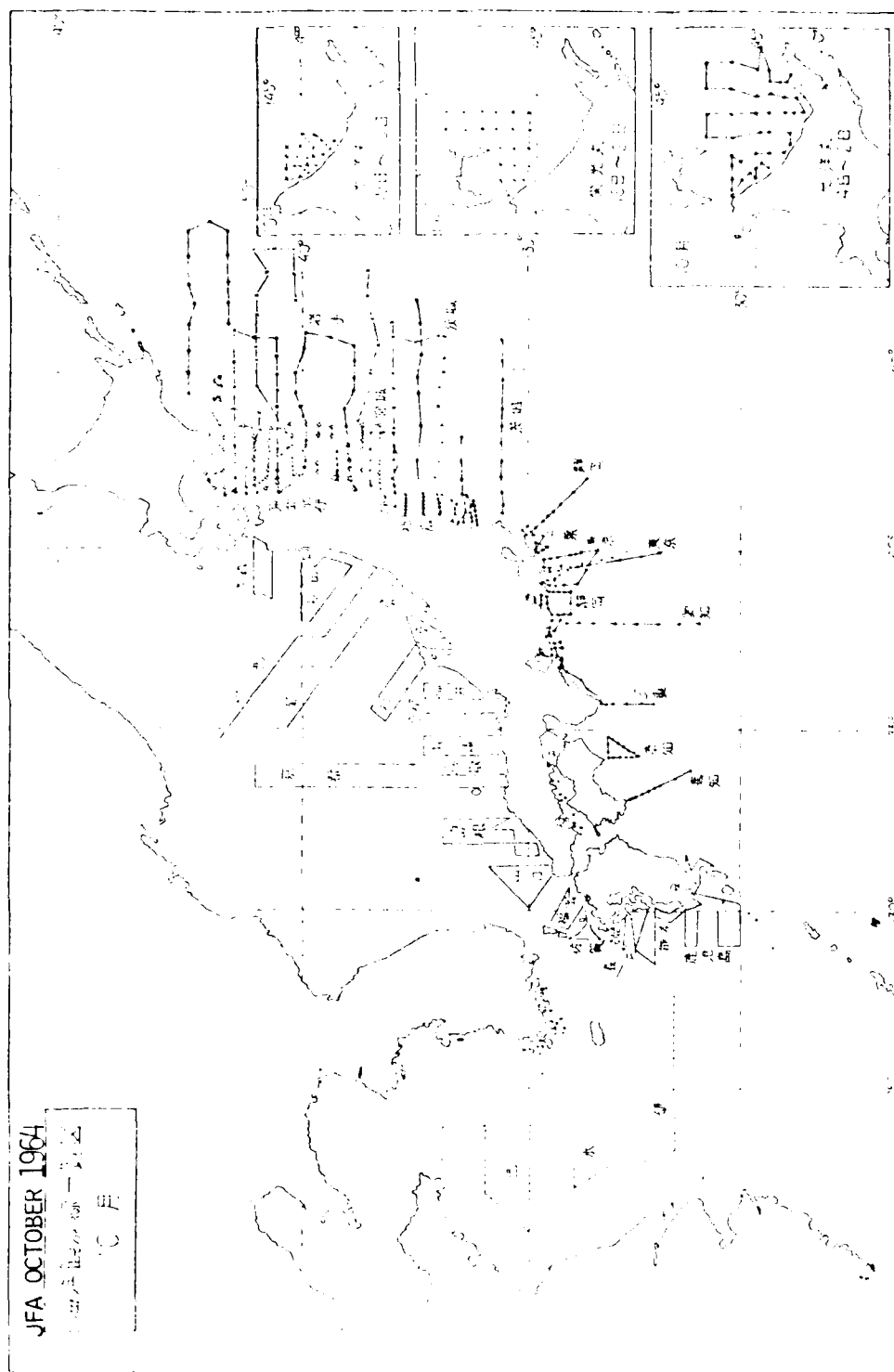


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1964

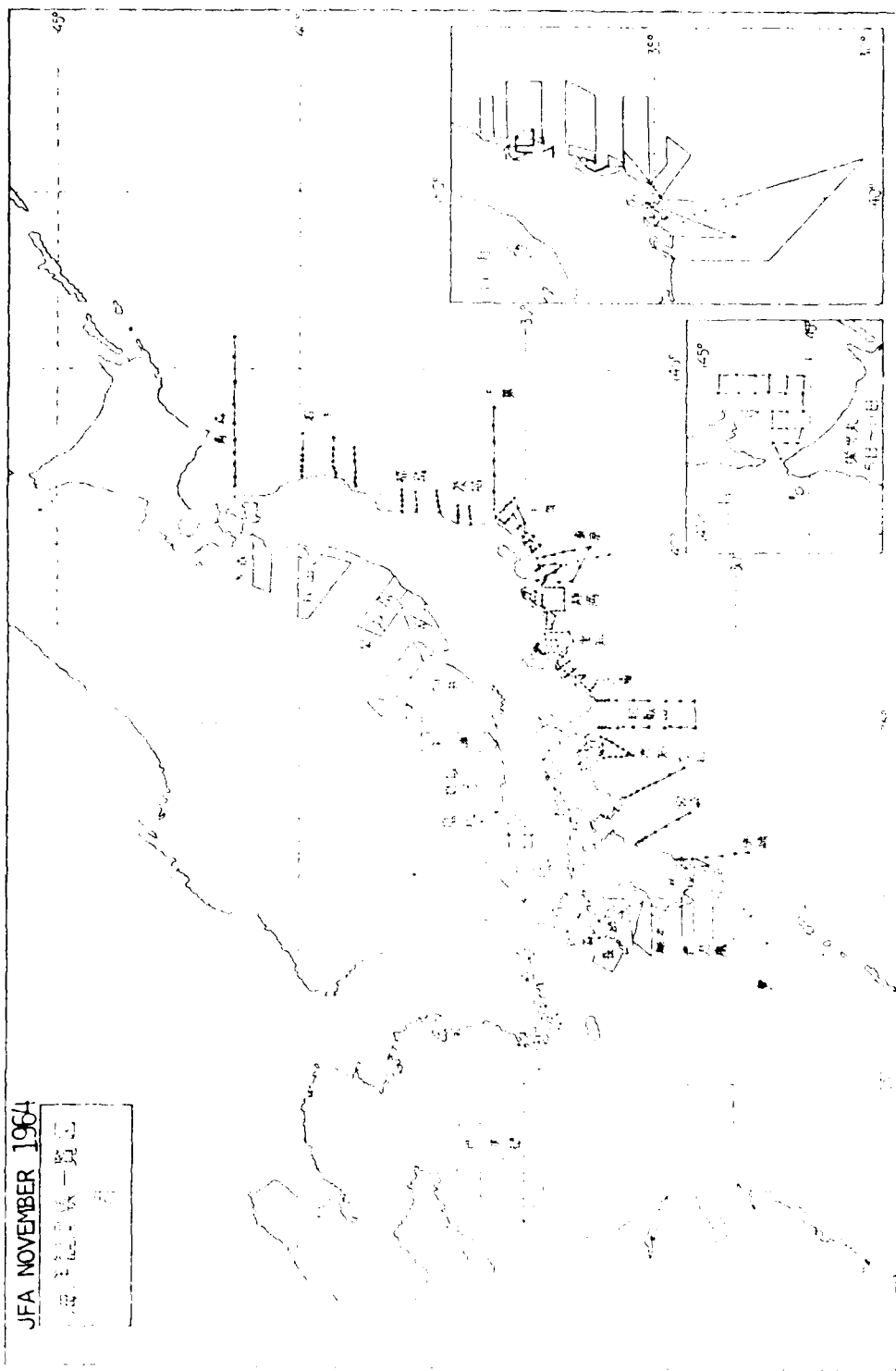


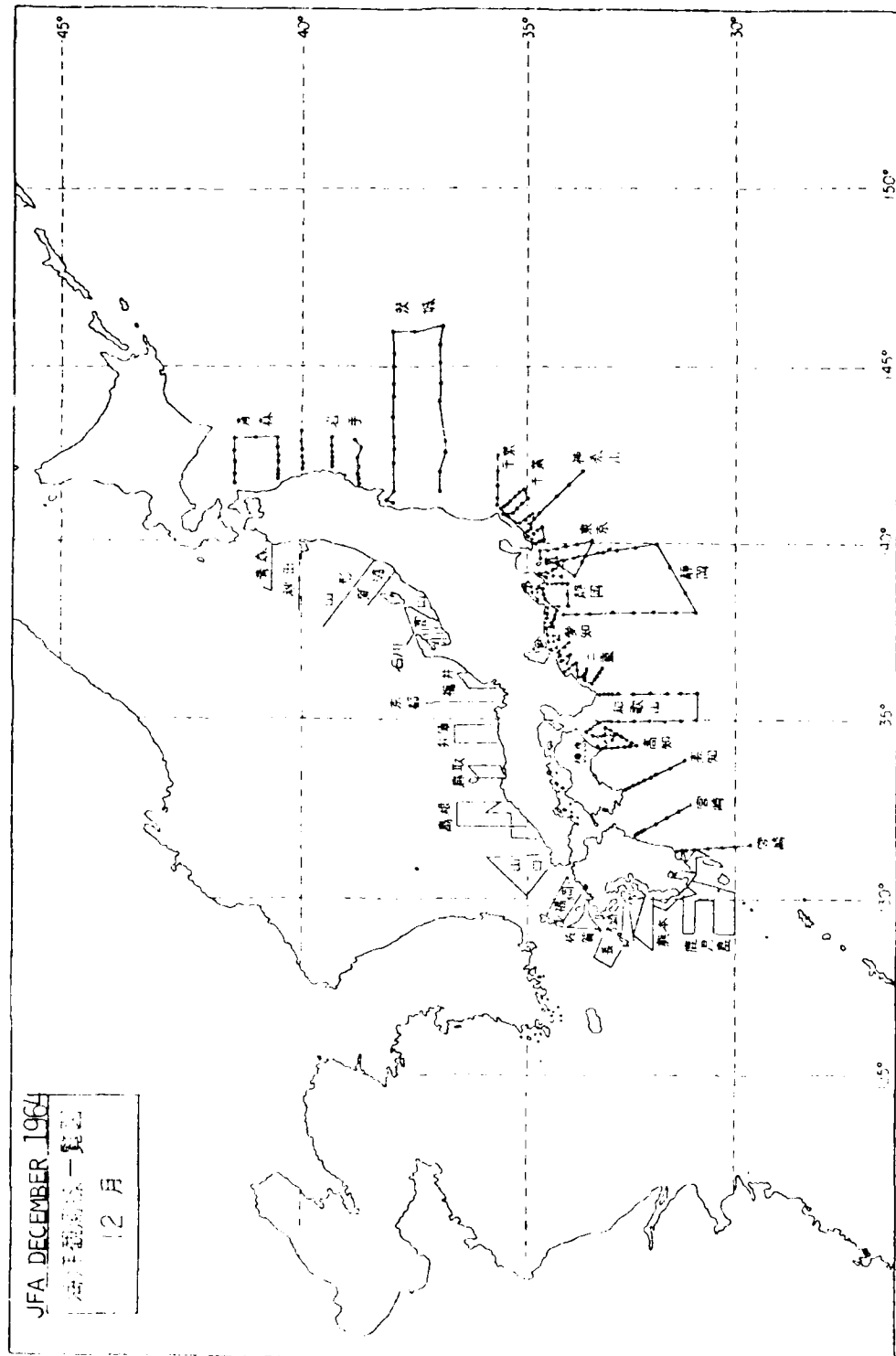
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR _____



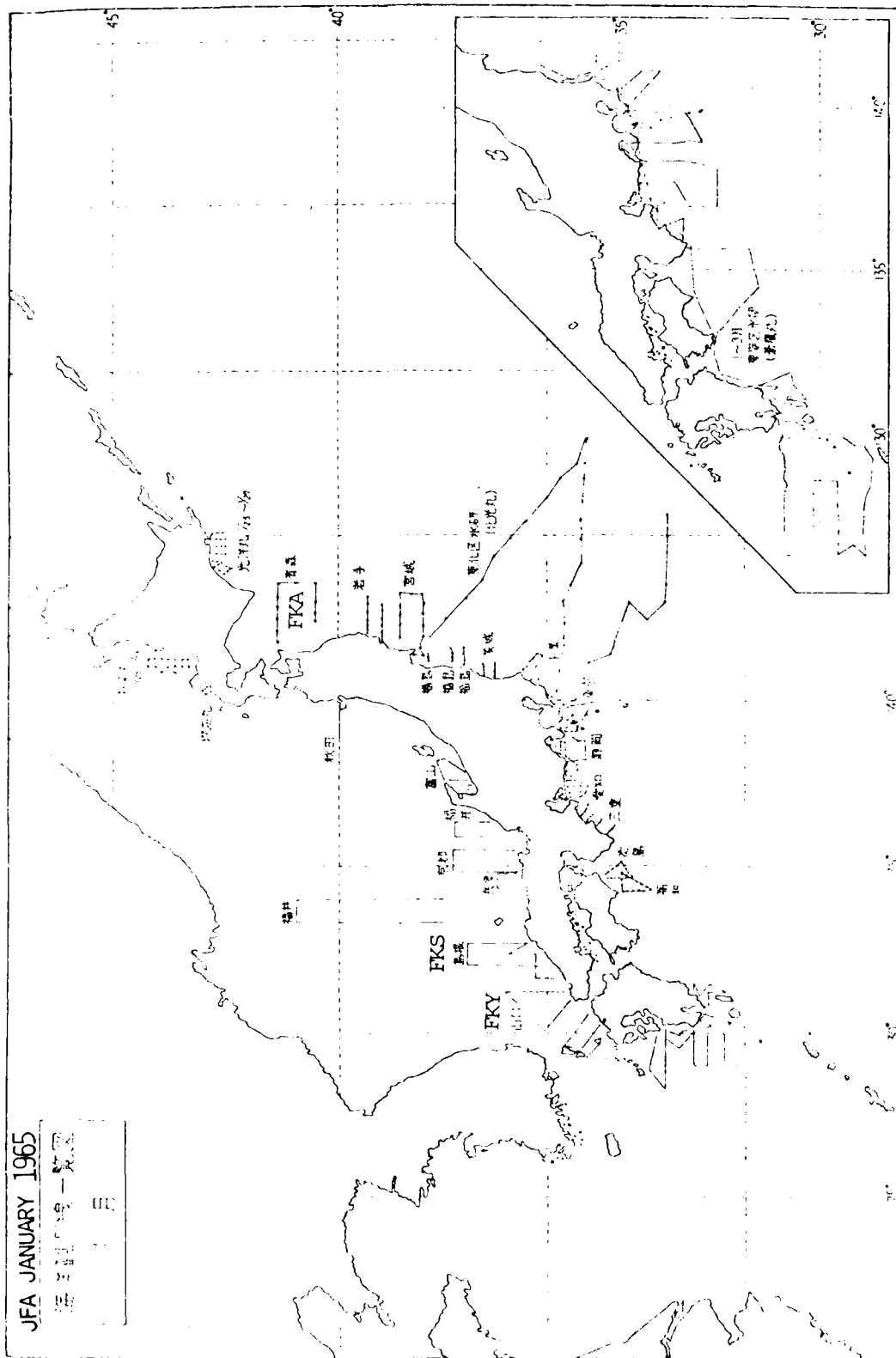


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1964





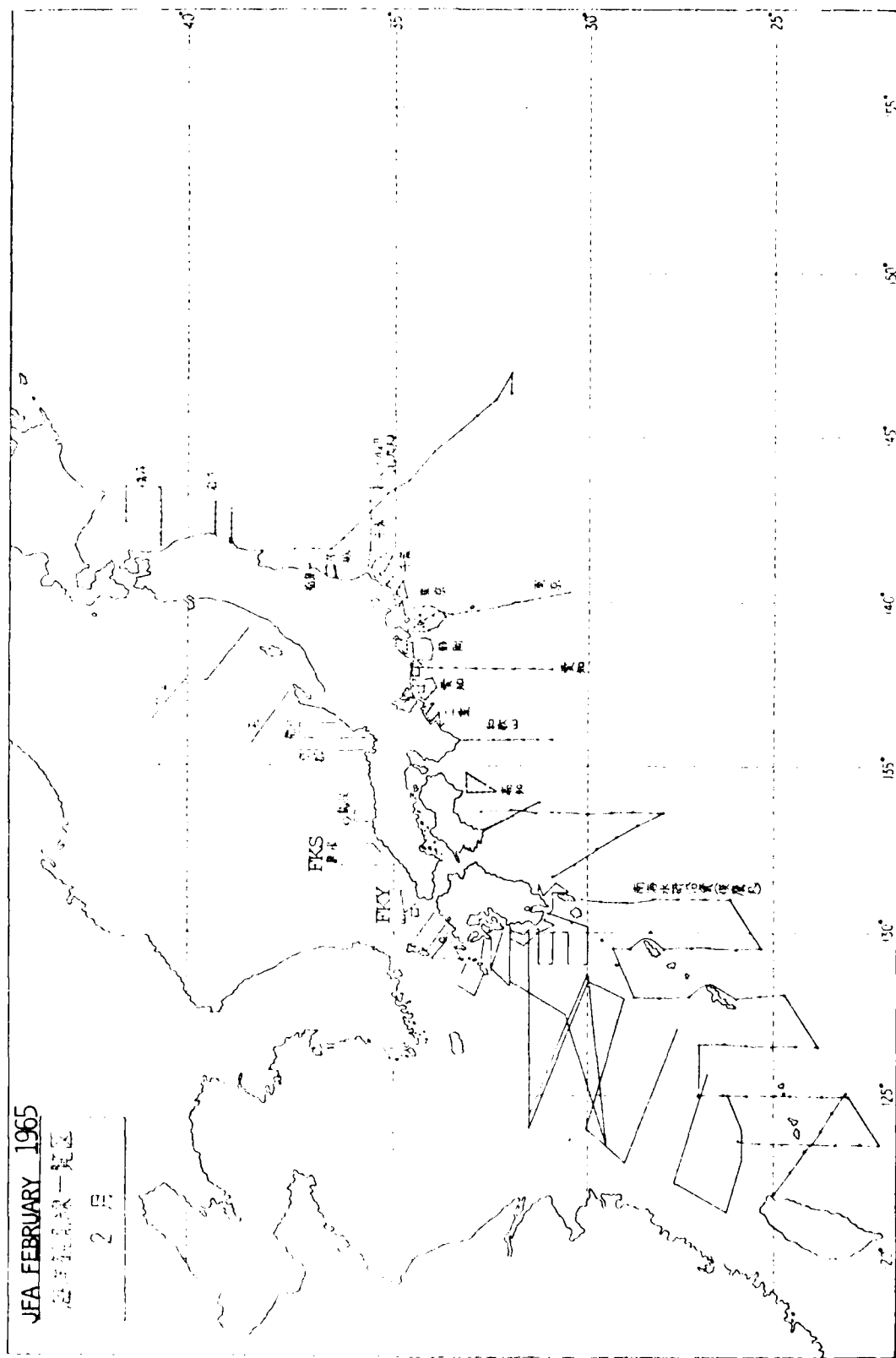
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1954



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

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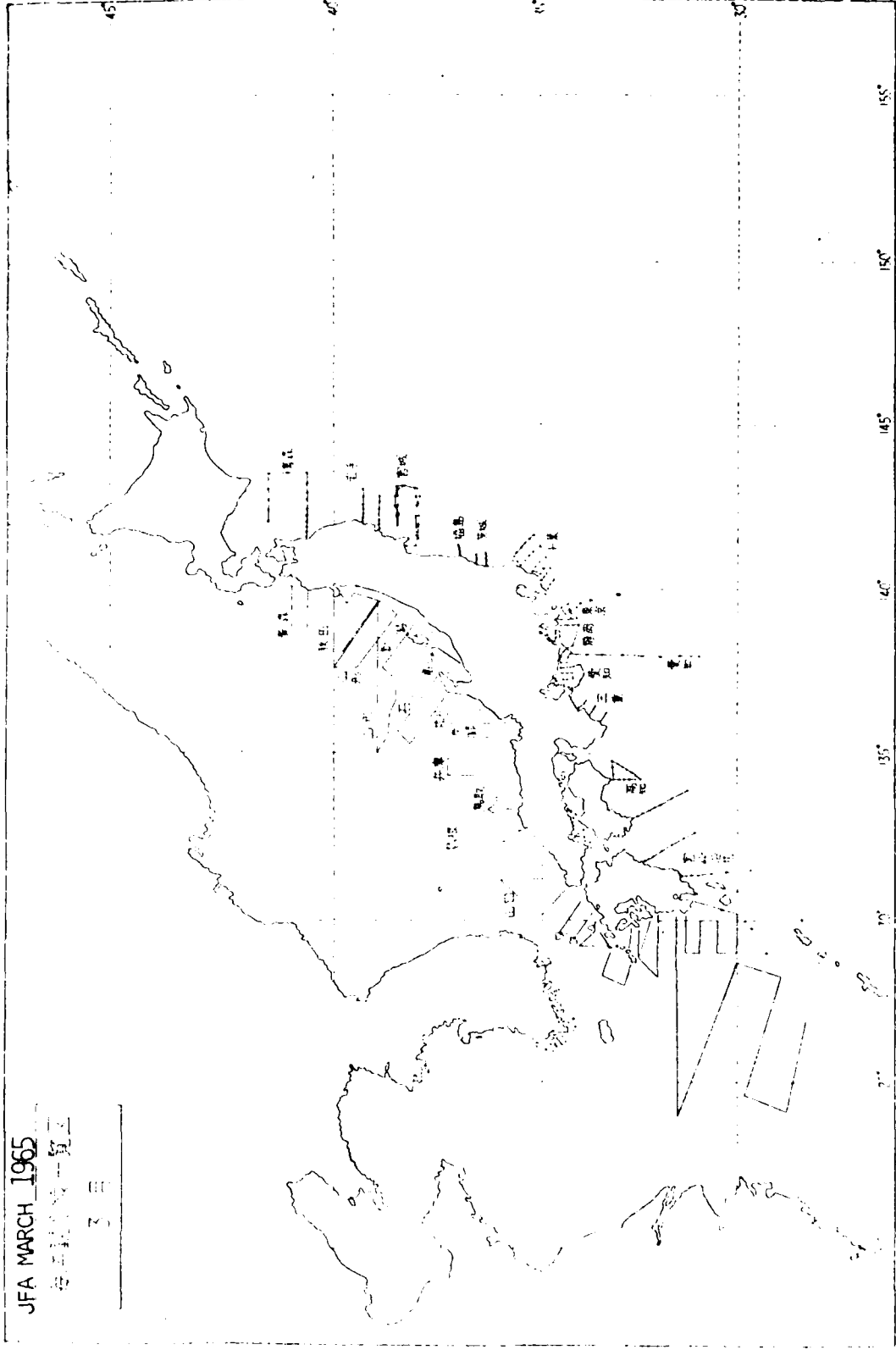


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

JFA MARCH 1965

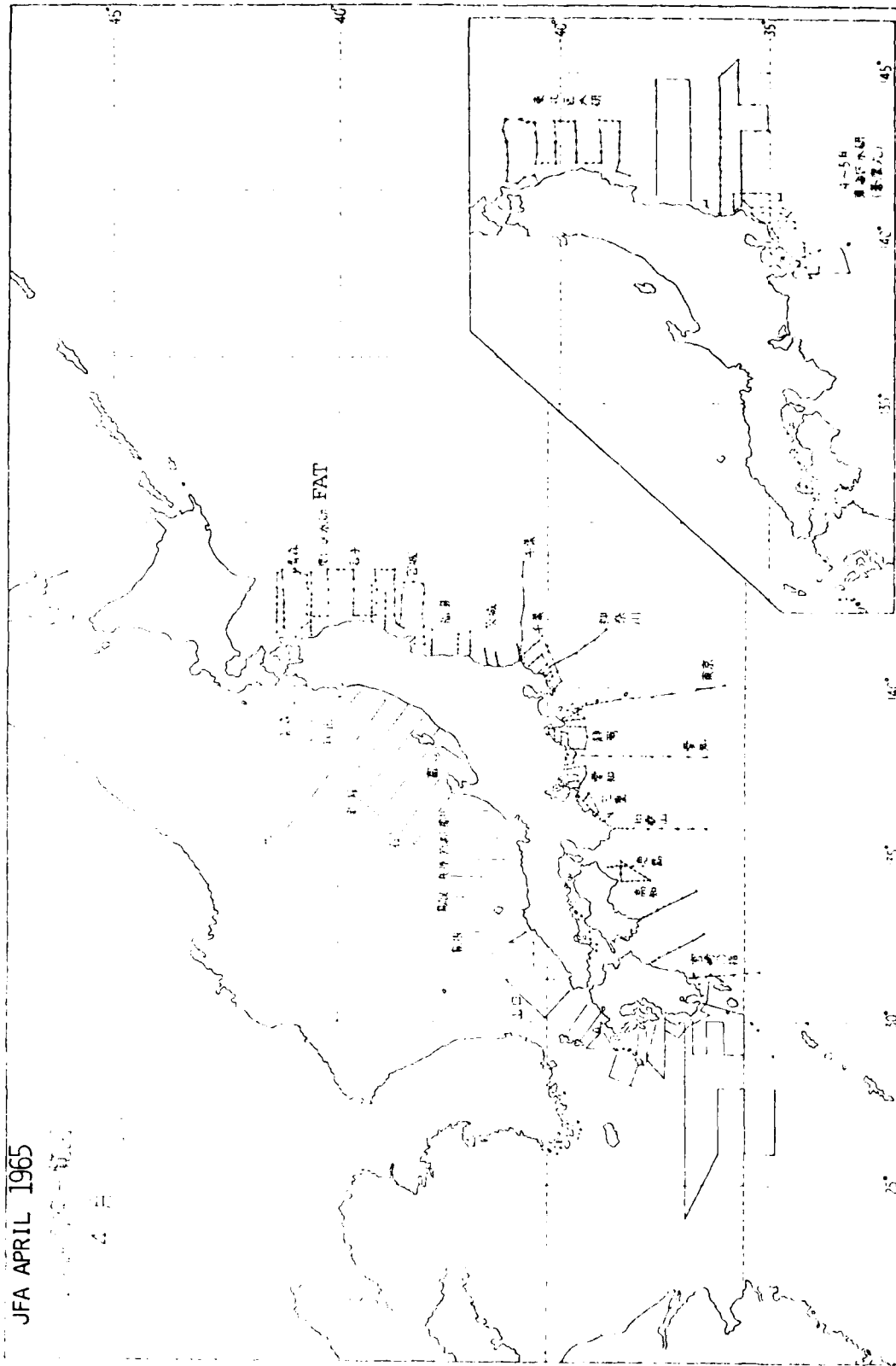
毎月航行一覽表

三月

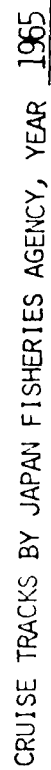


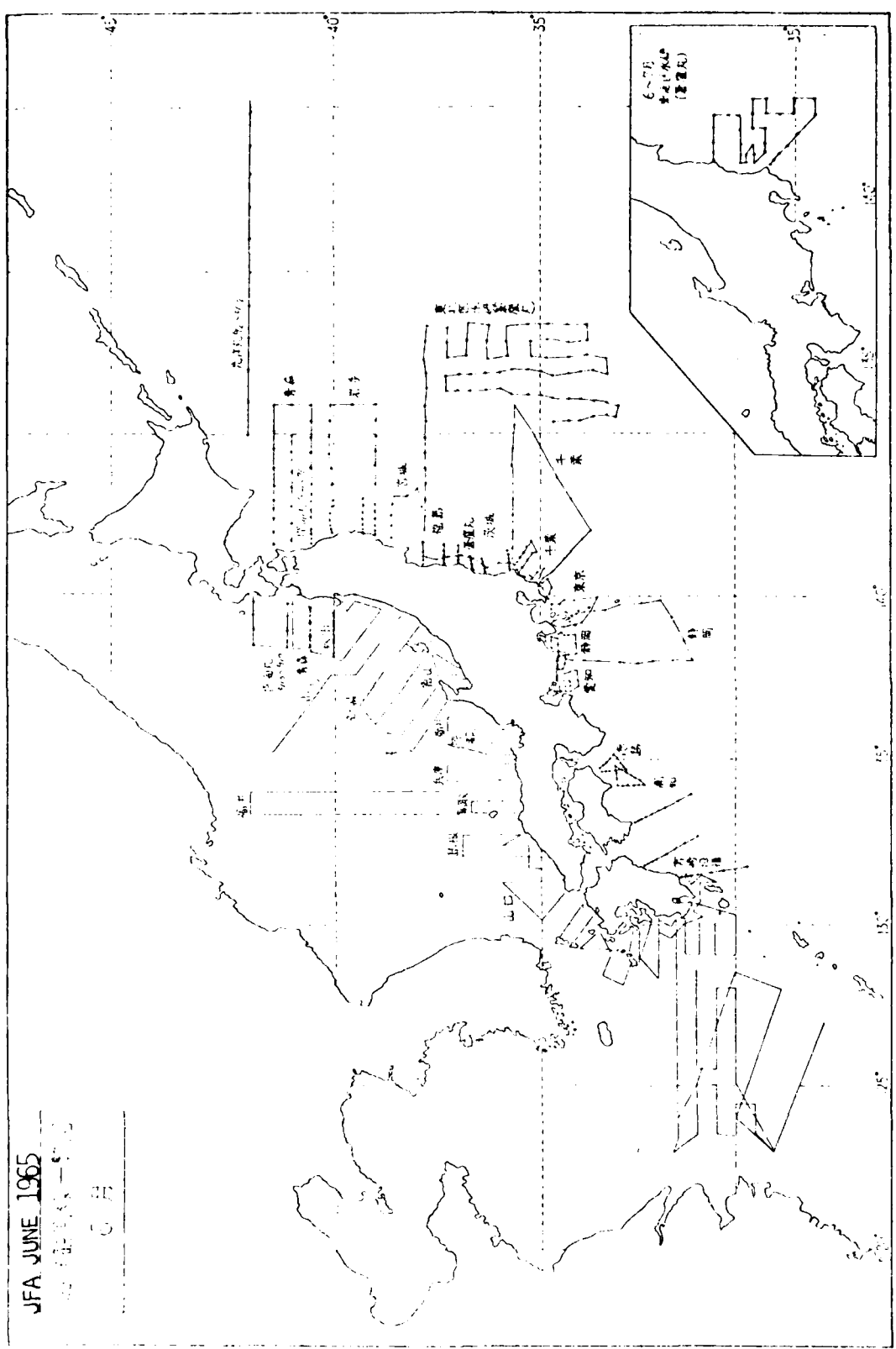
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

JFA APRIL 1965



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

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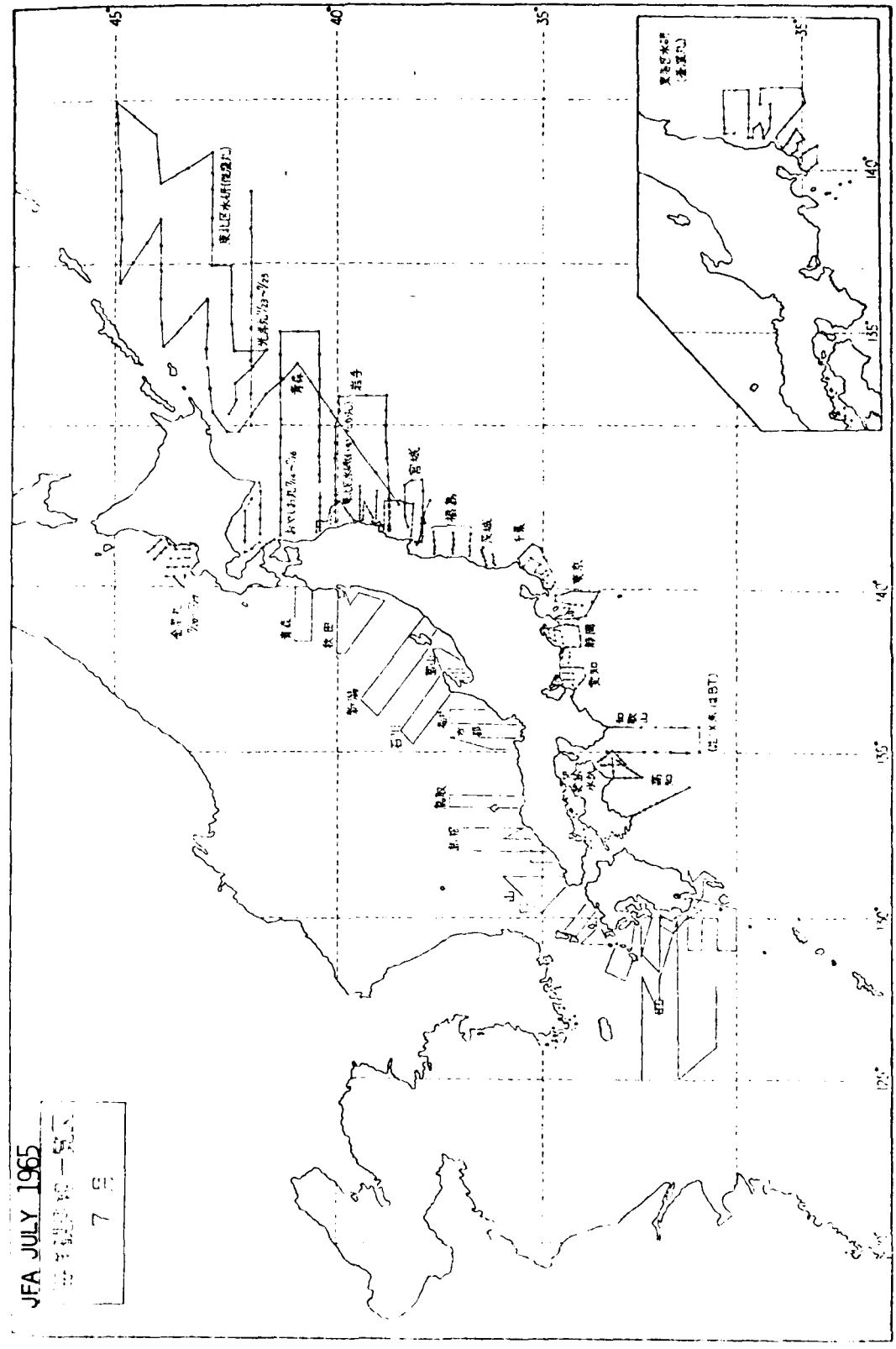
JFA JUNE 1965
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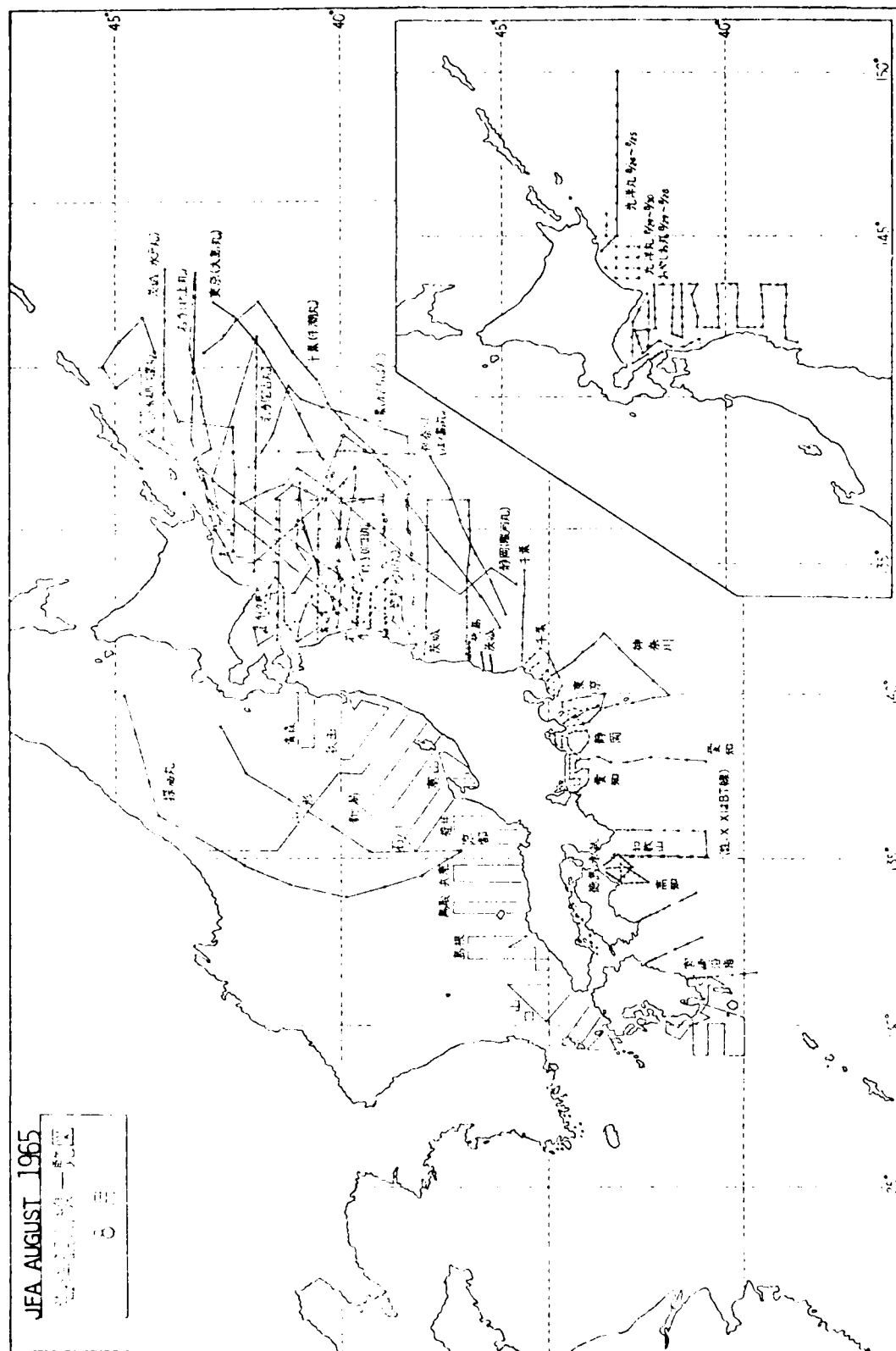
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CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

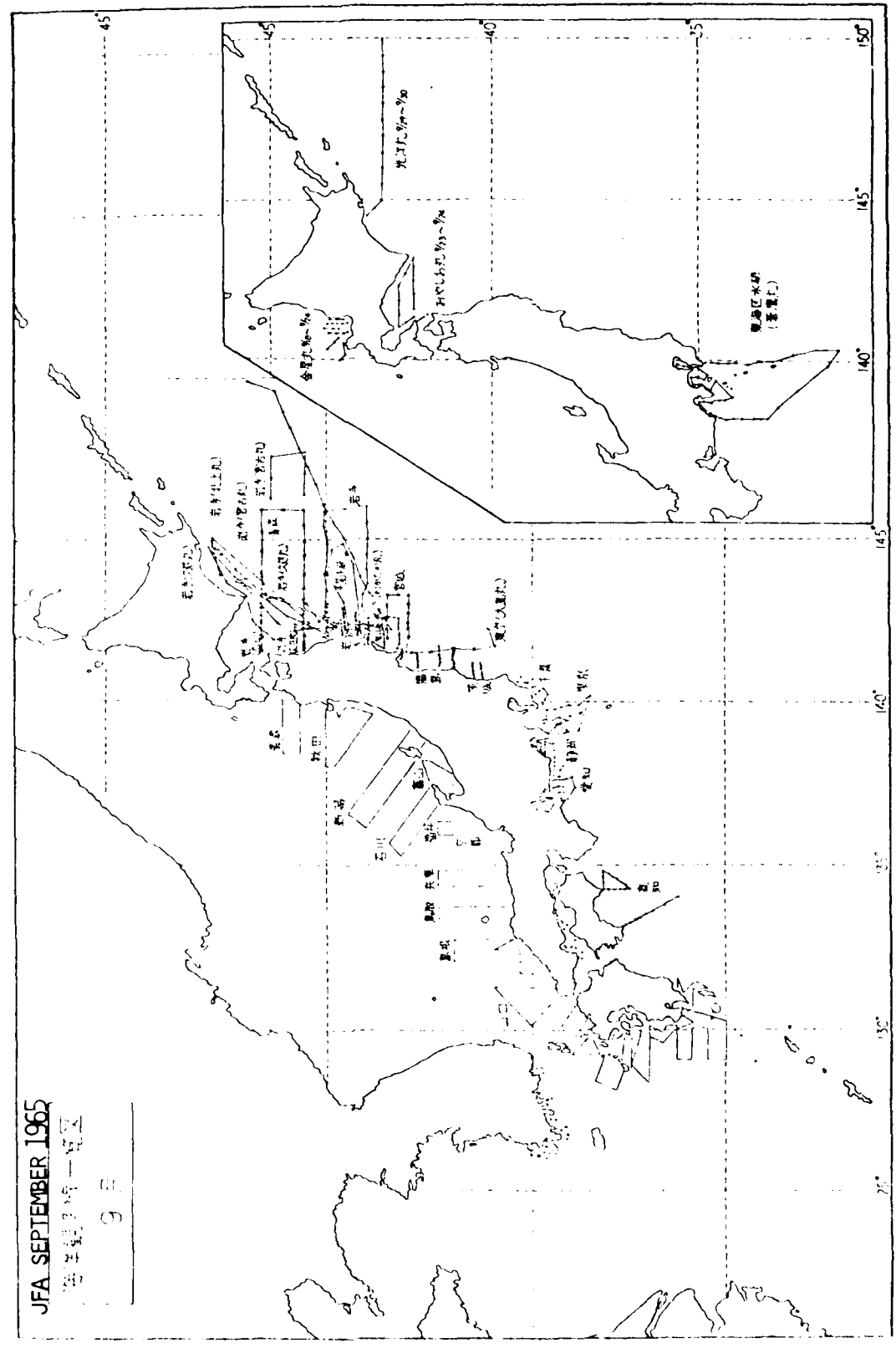


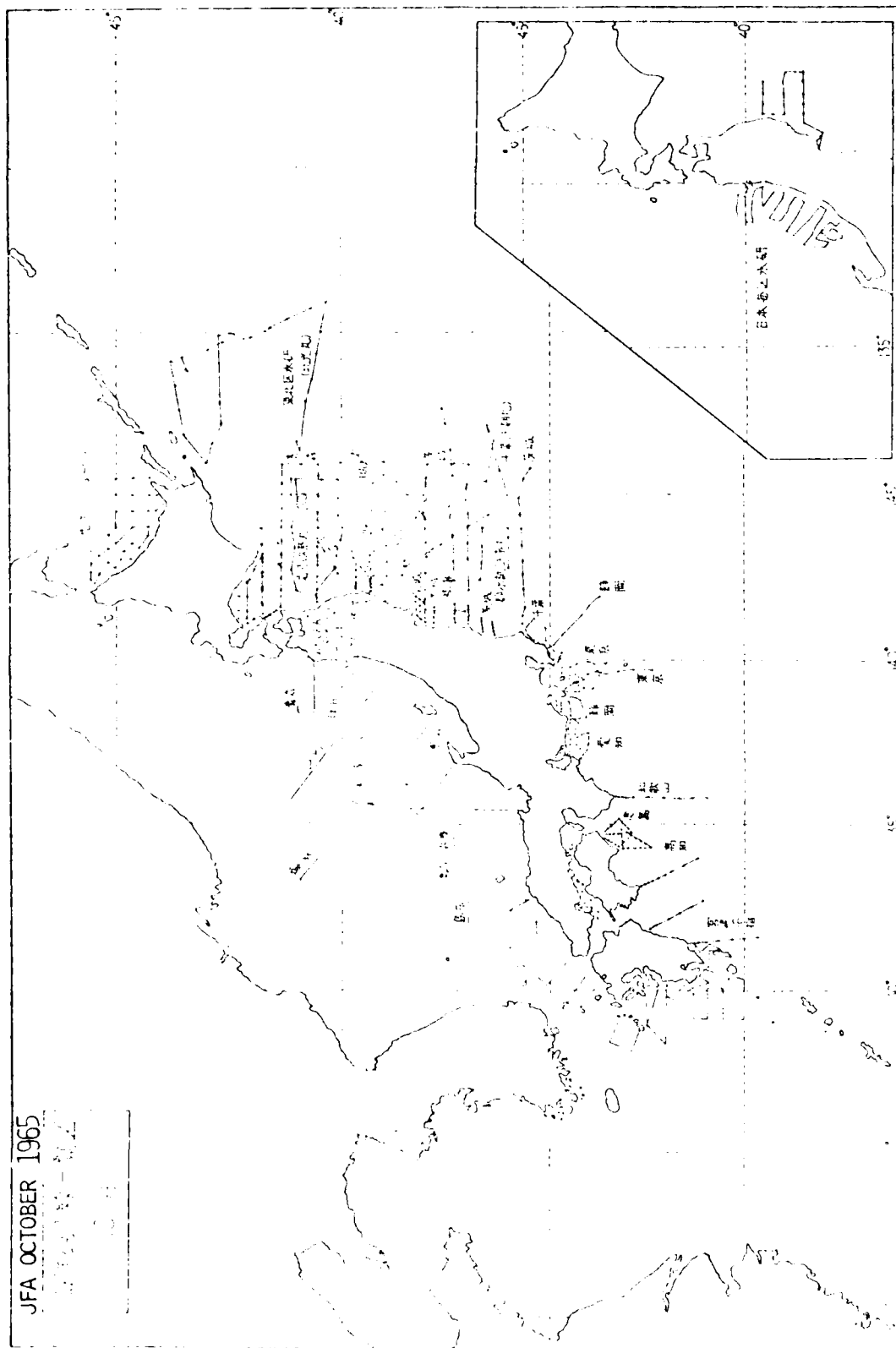
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965

JFA SEPTEMBER 1965

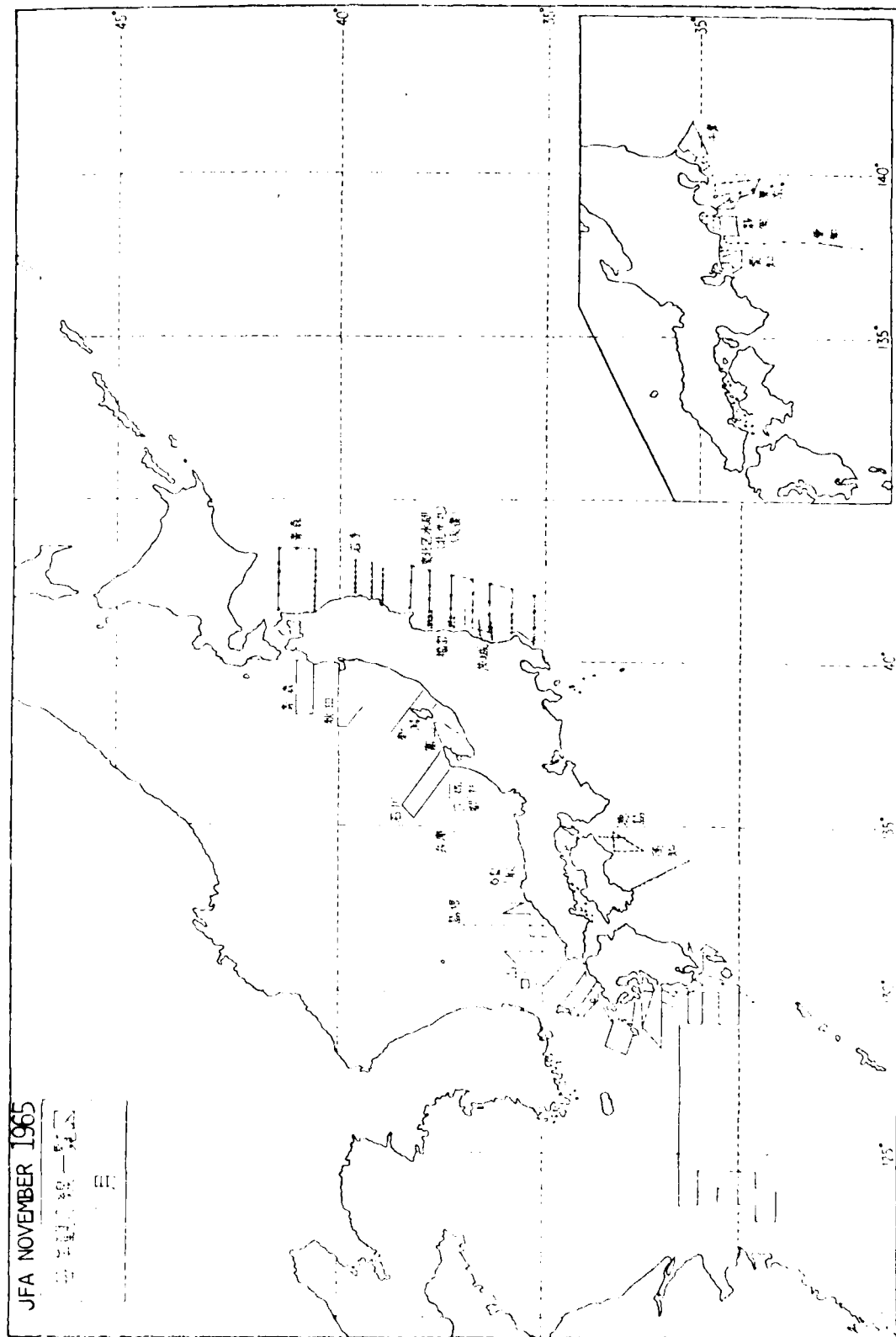
海王丸 第一航区

9月

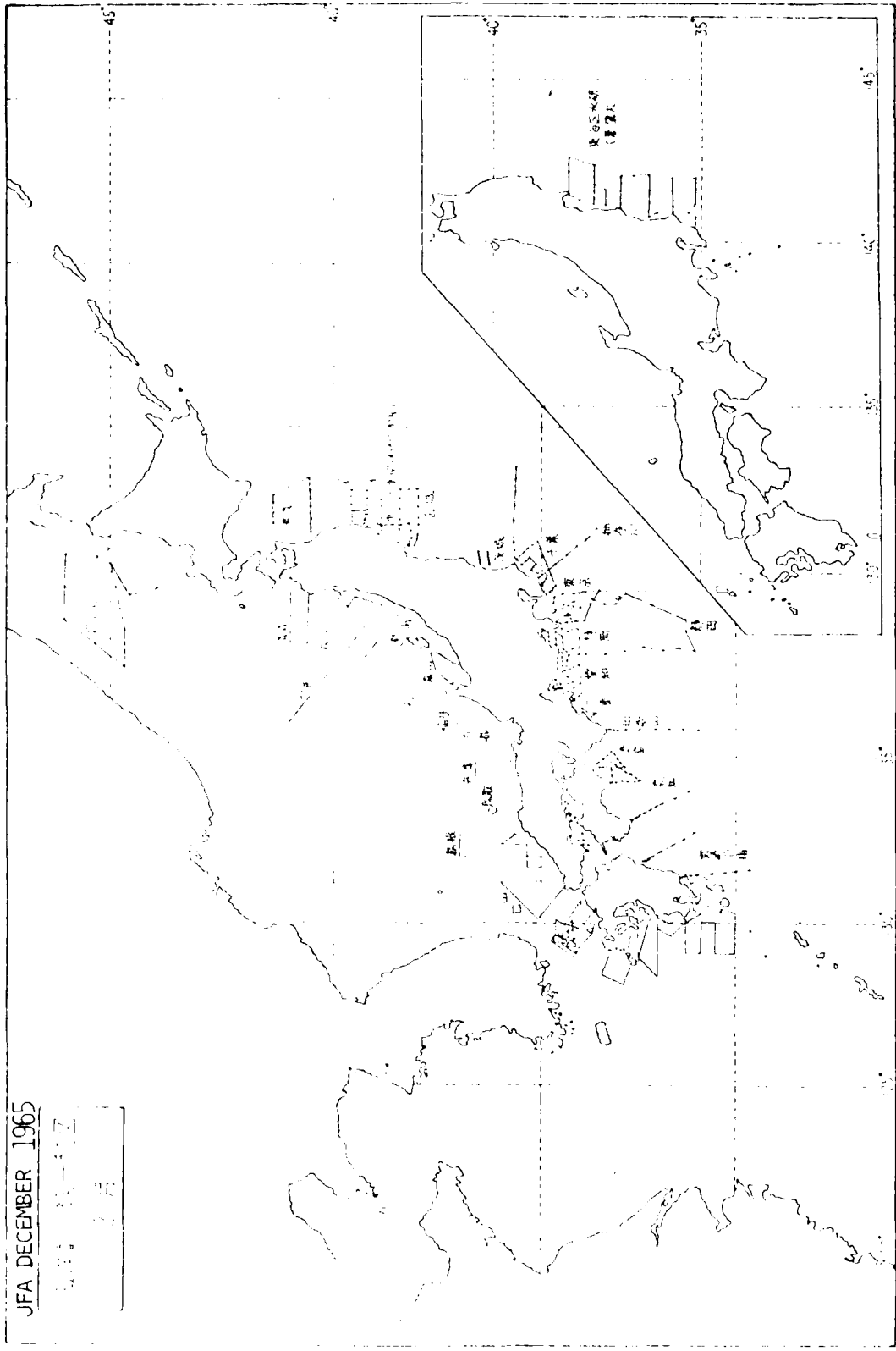




CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1965



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CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1966

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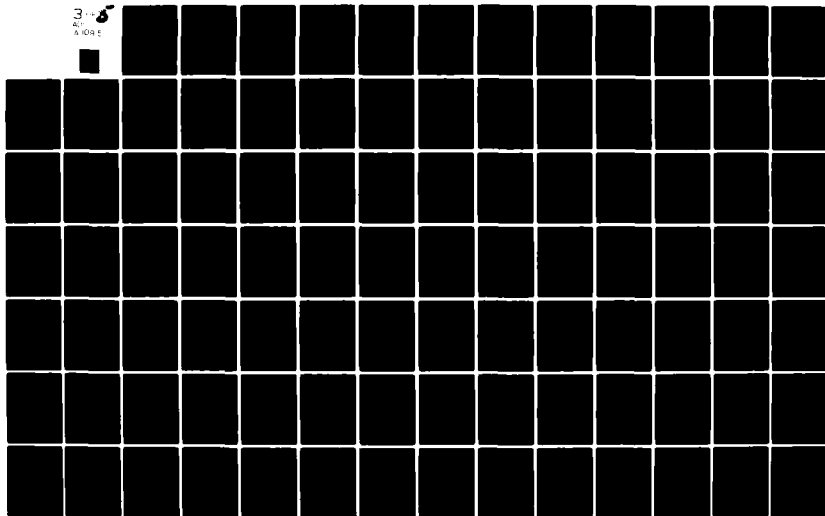
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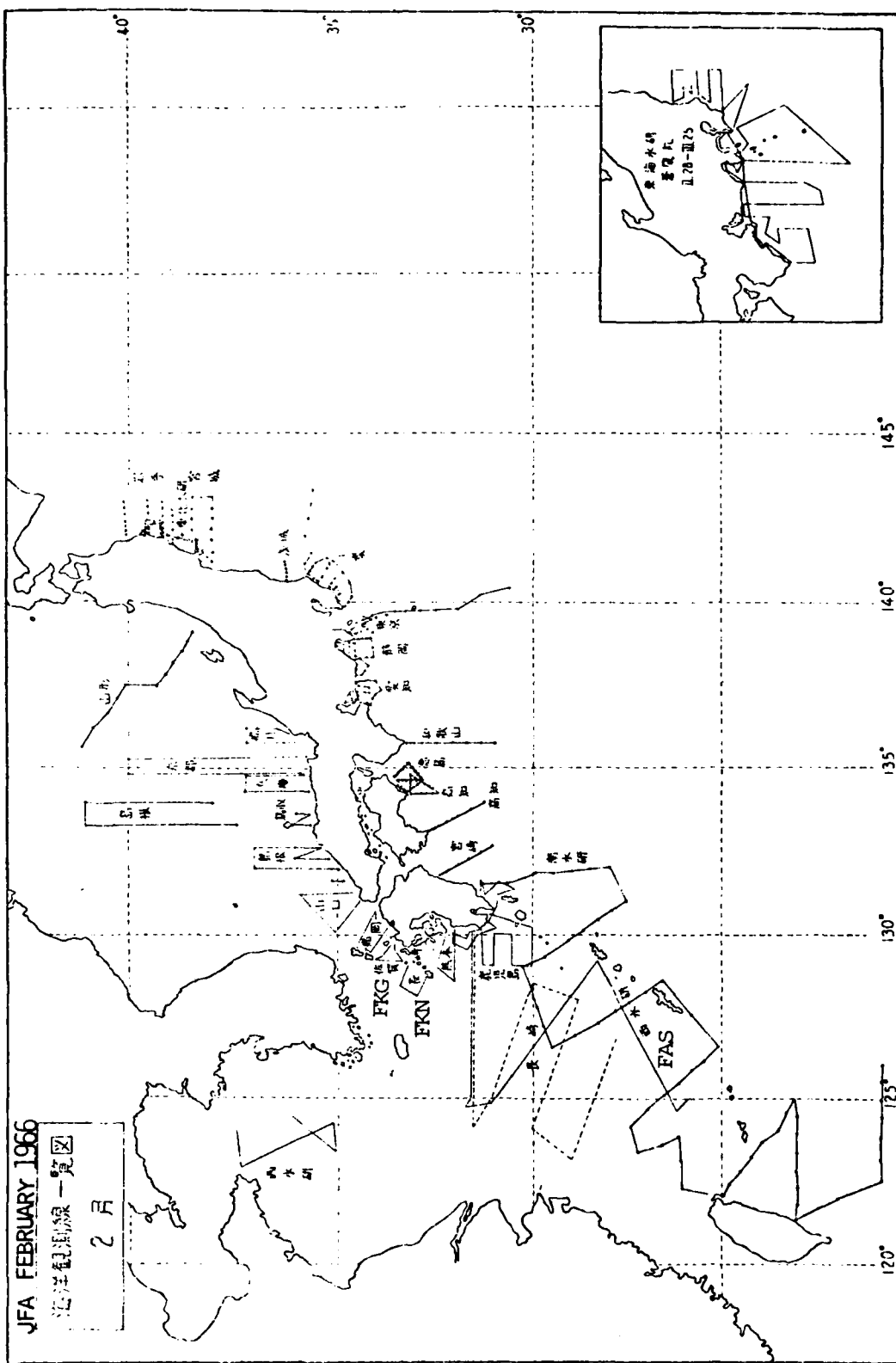
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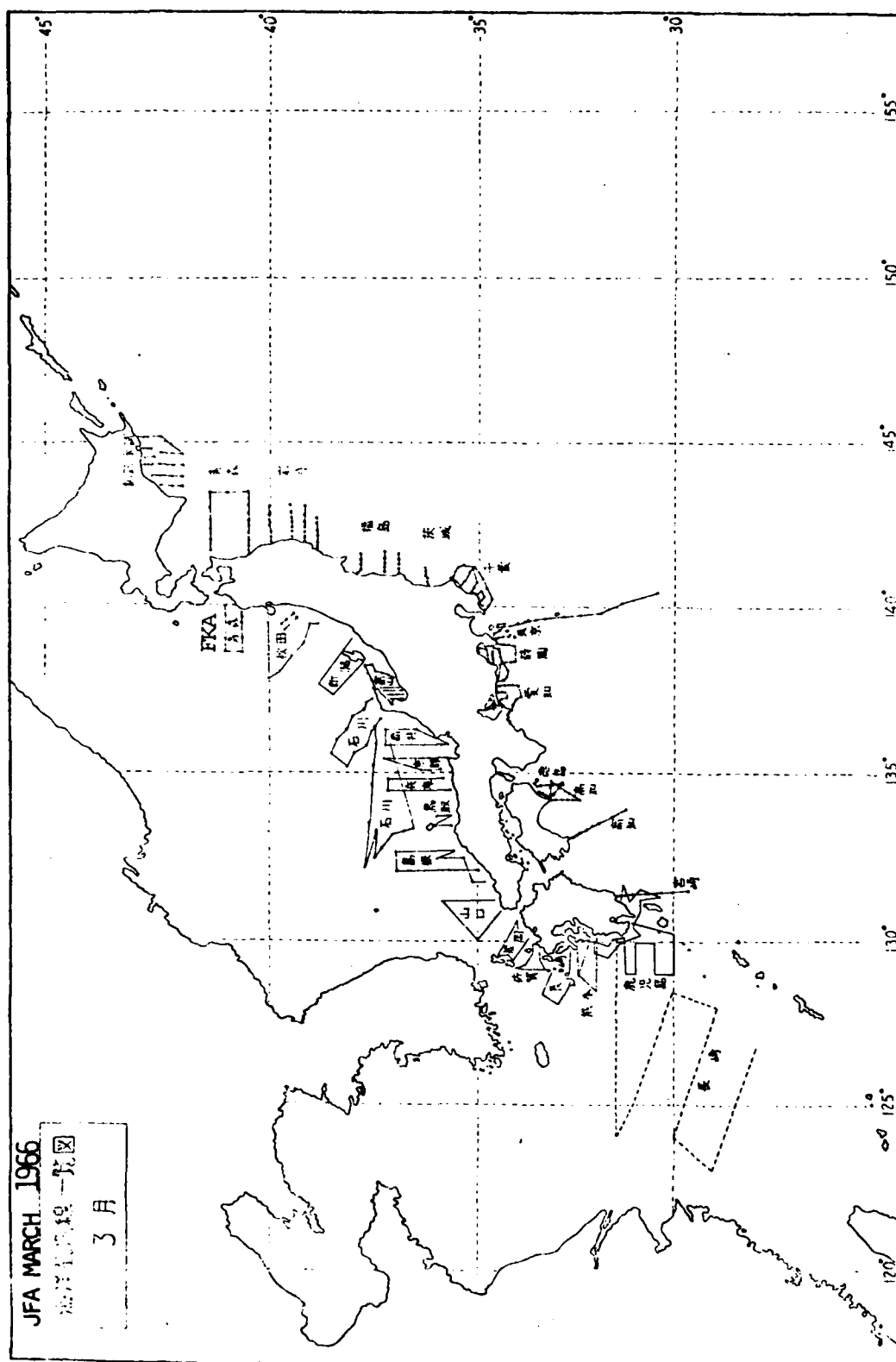
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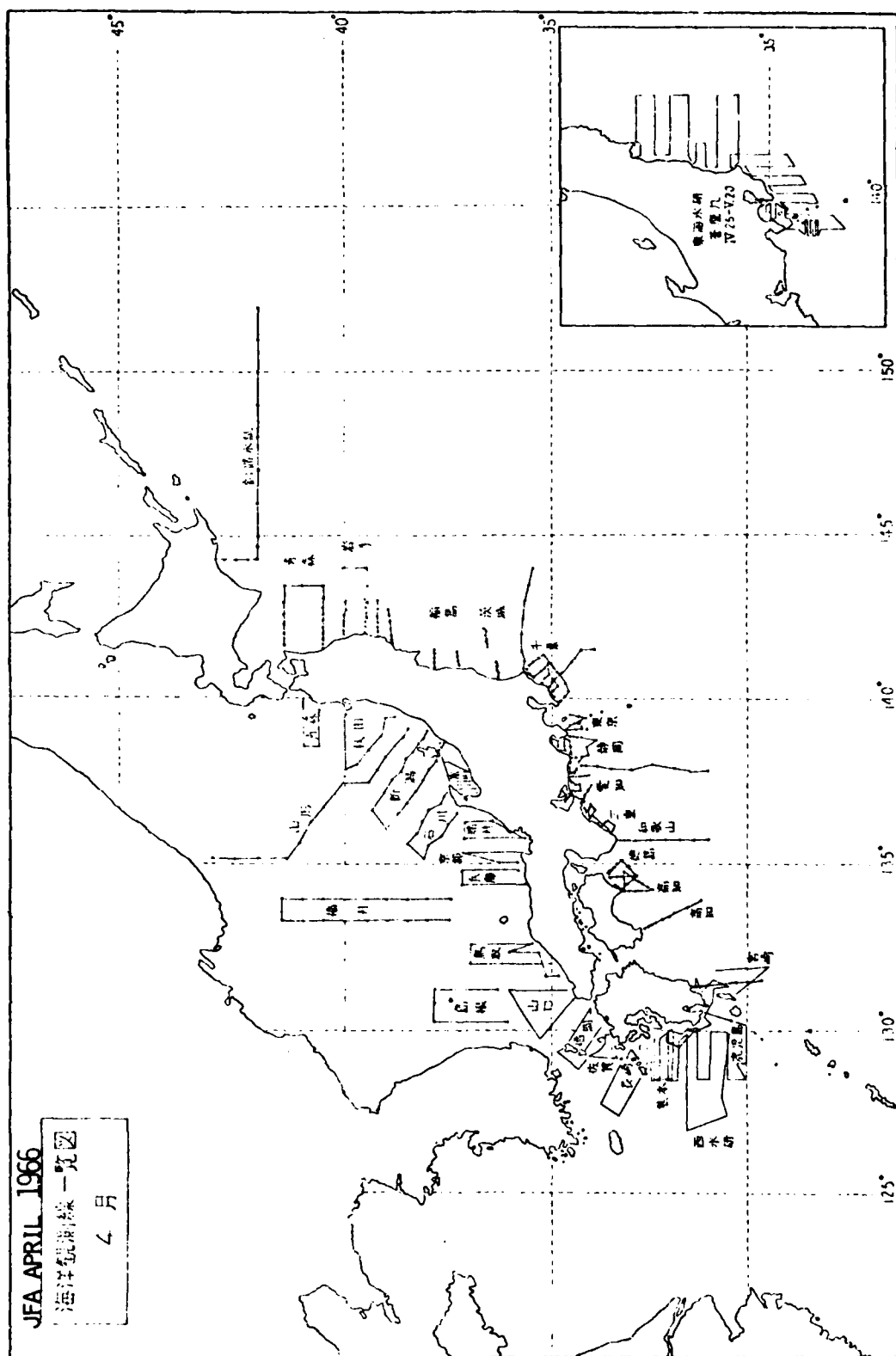
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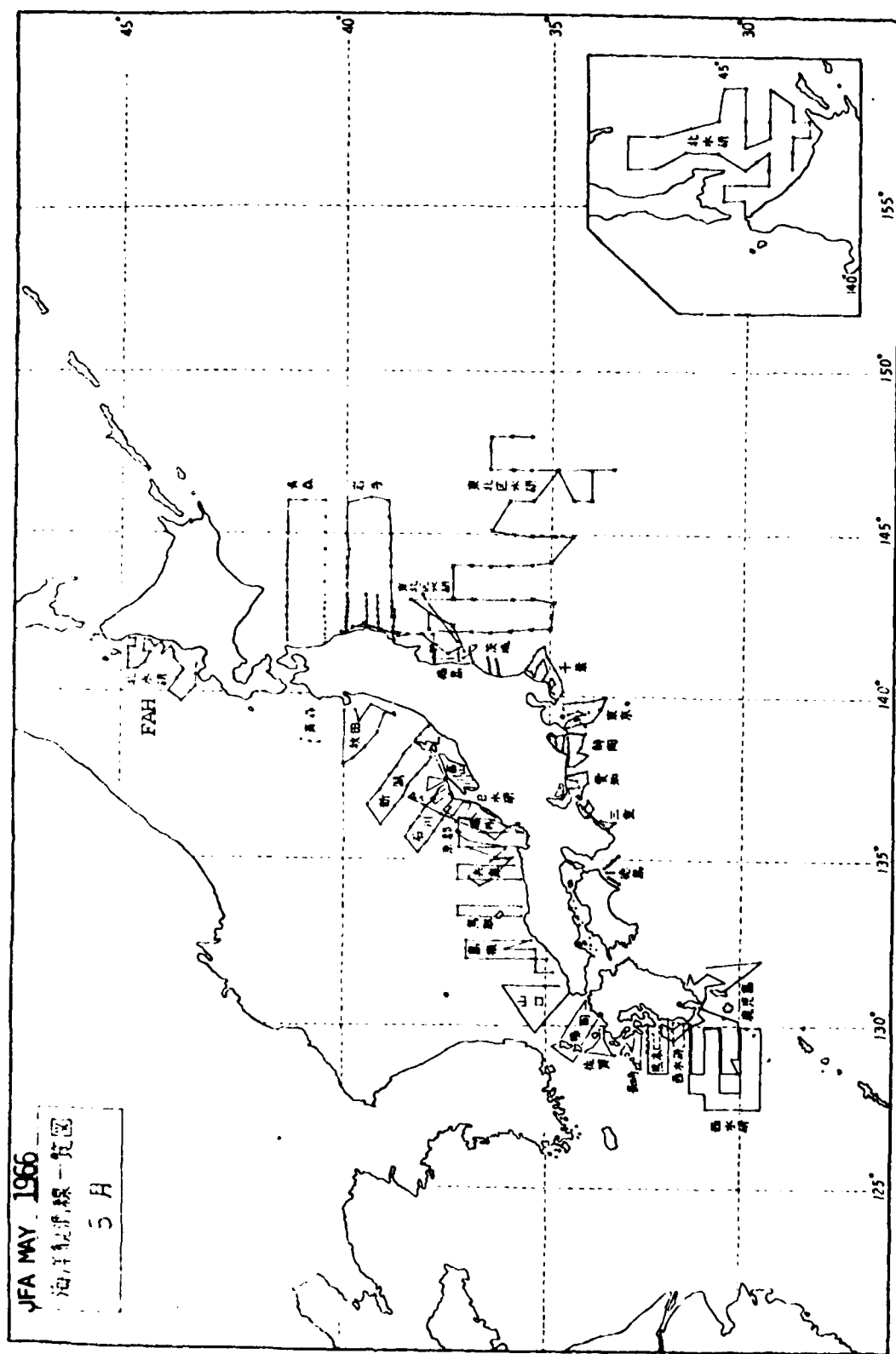


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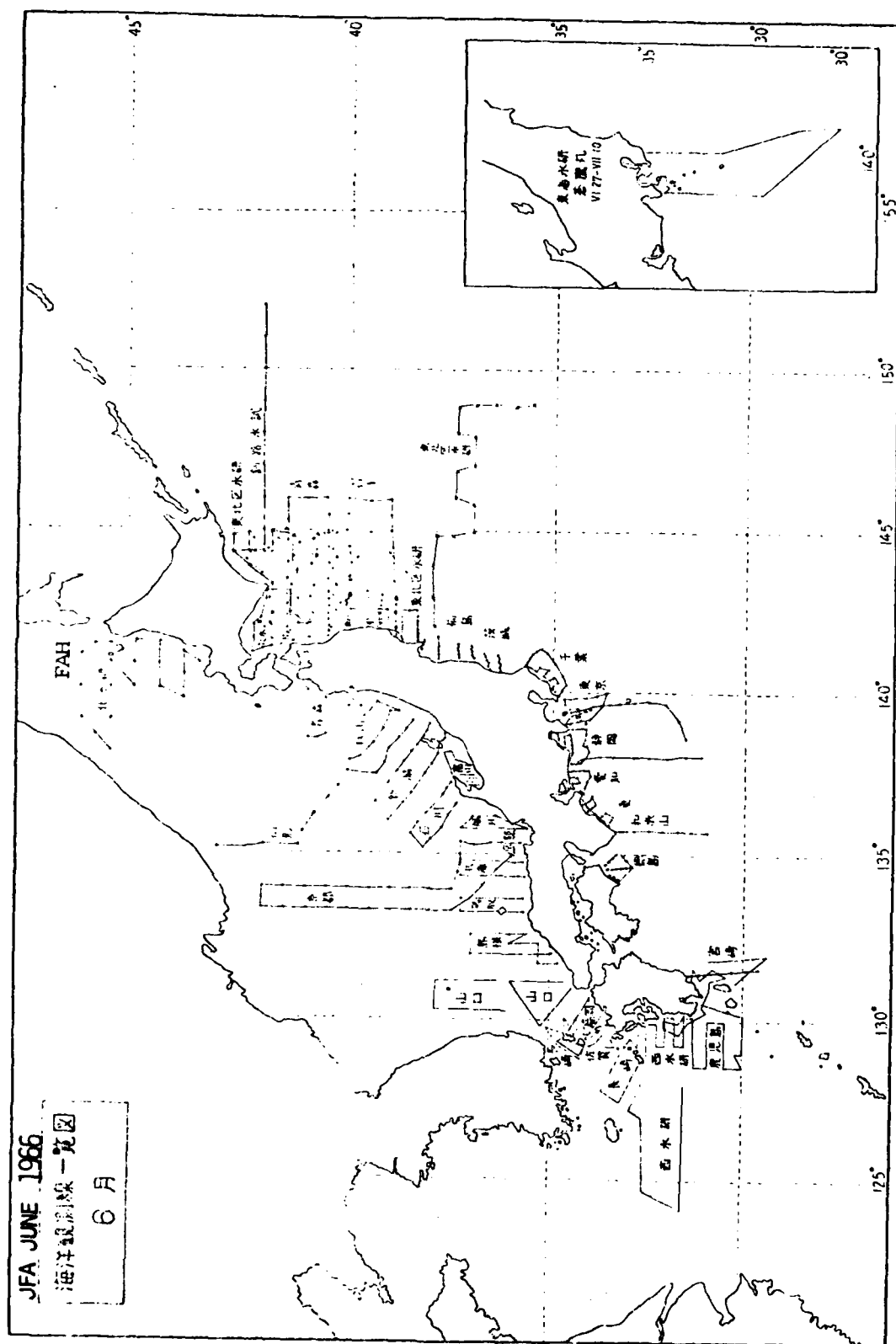


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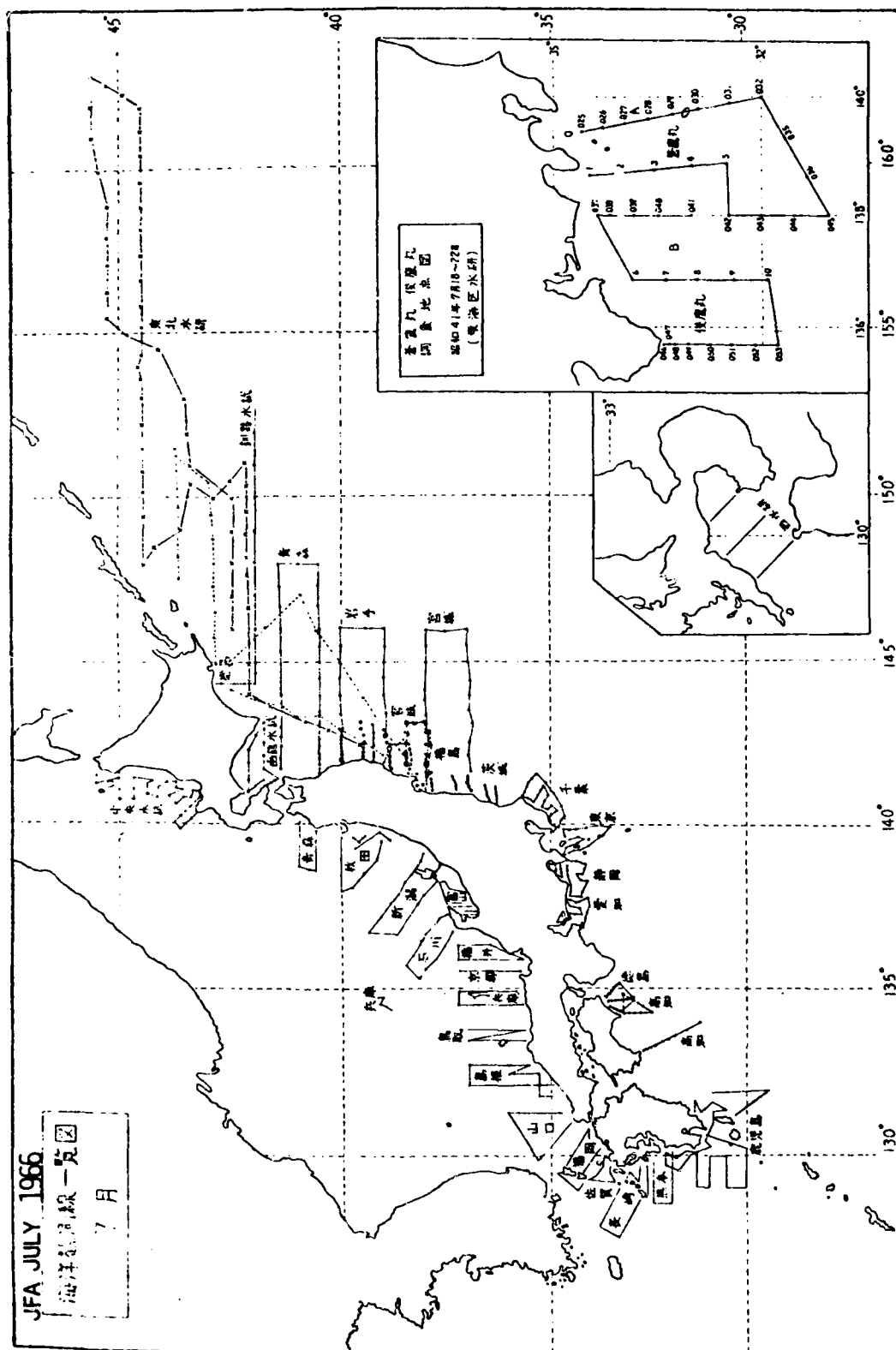


JFA MAY 1966
海洋観測線一覽図
5月

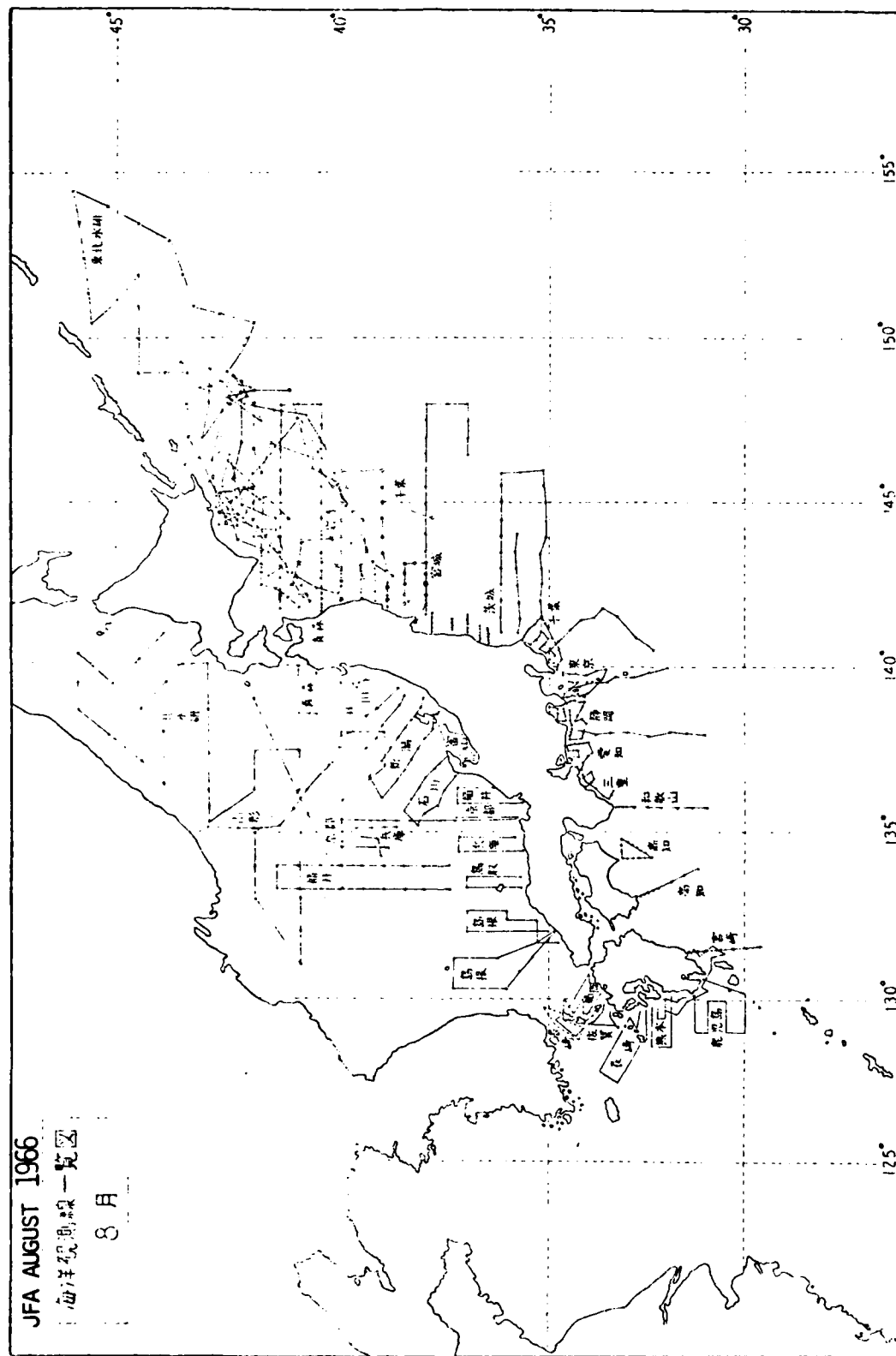
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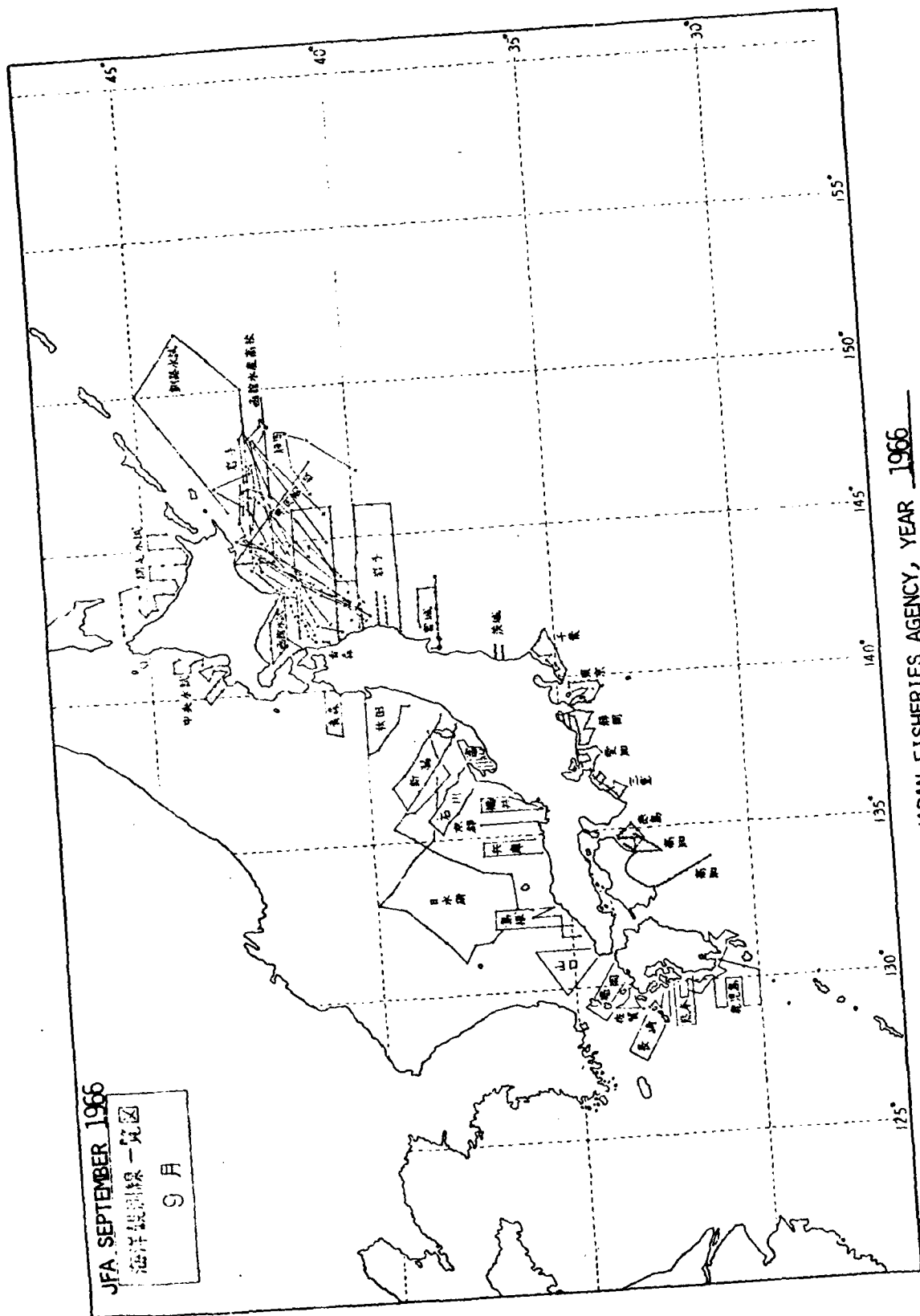
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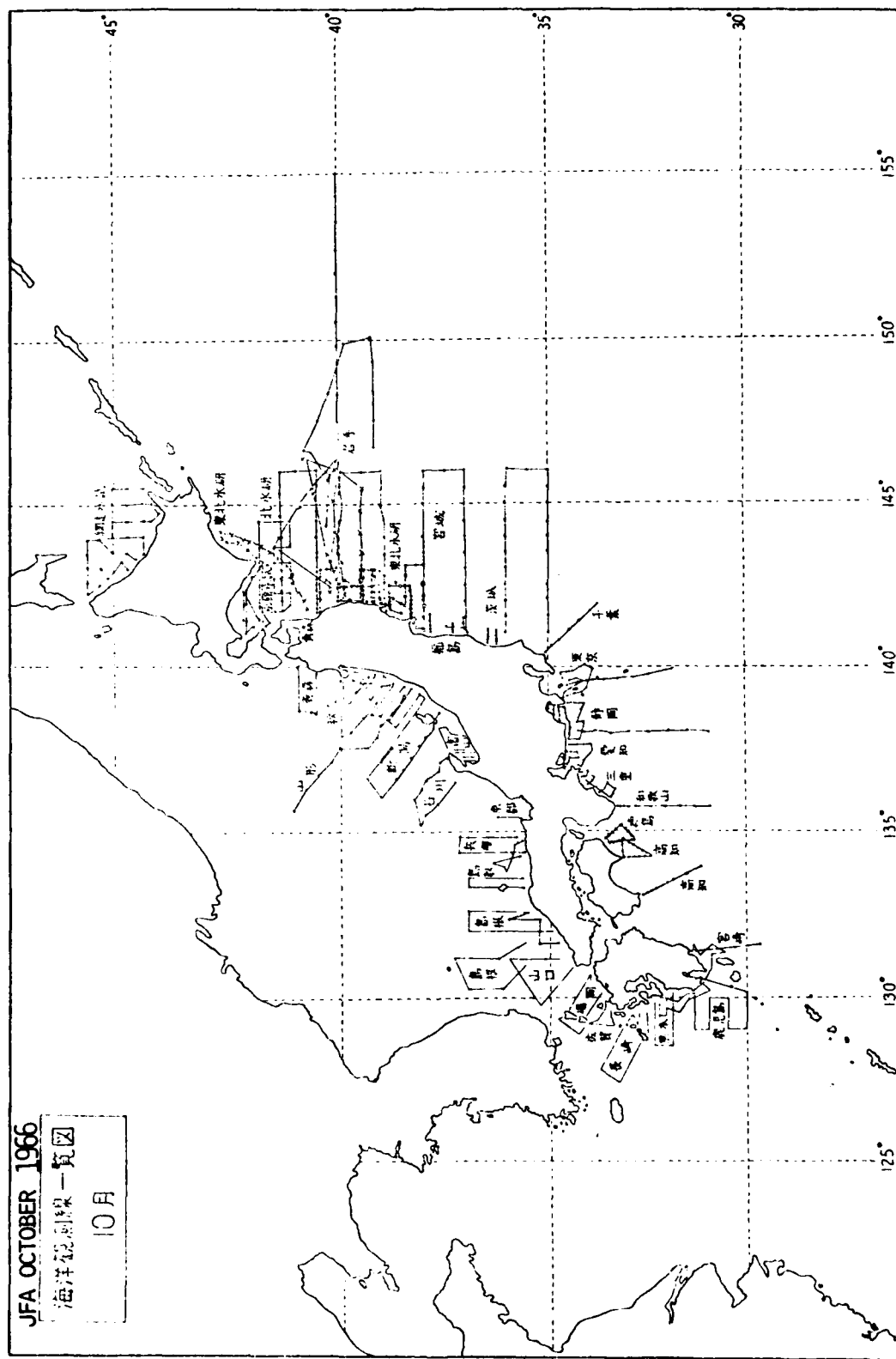
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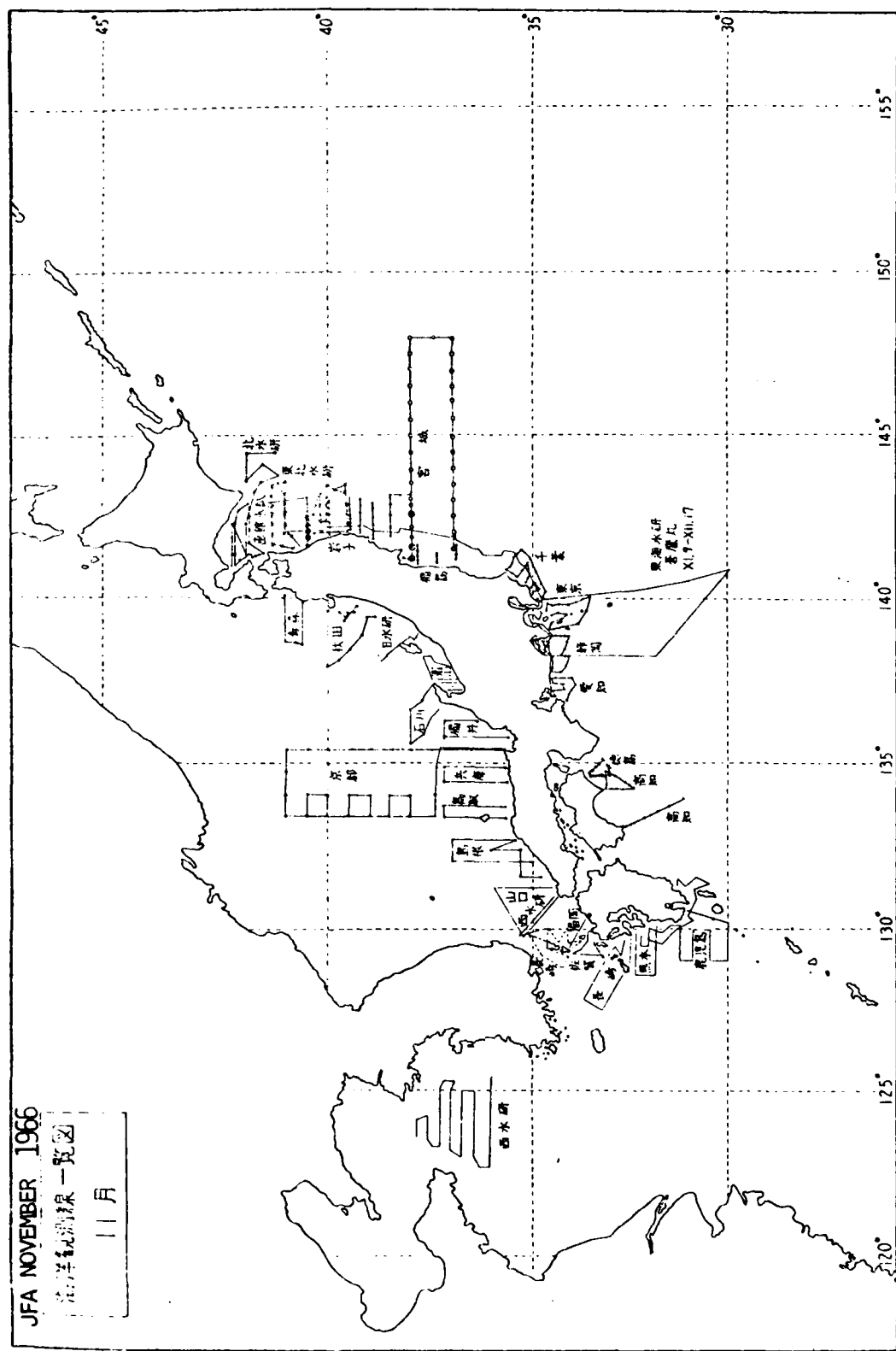
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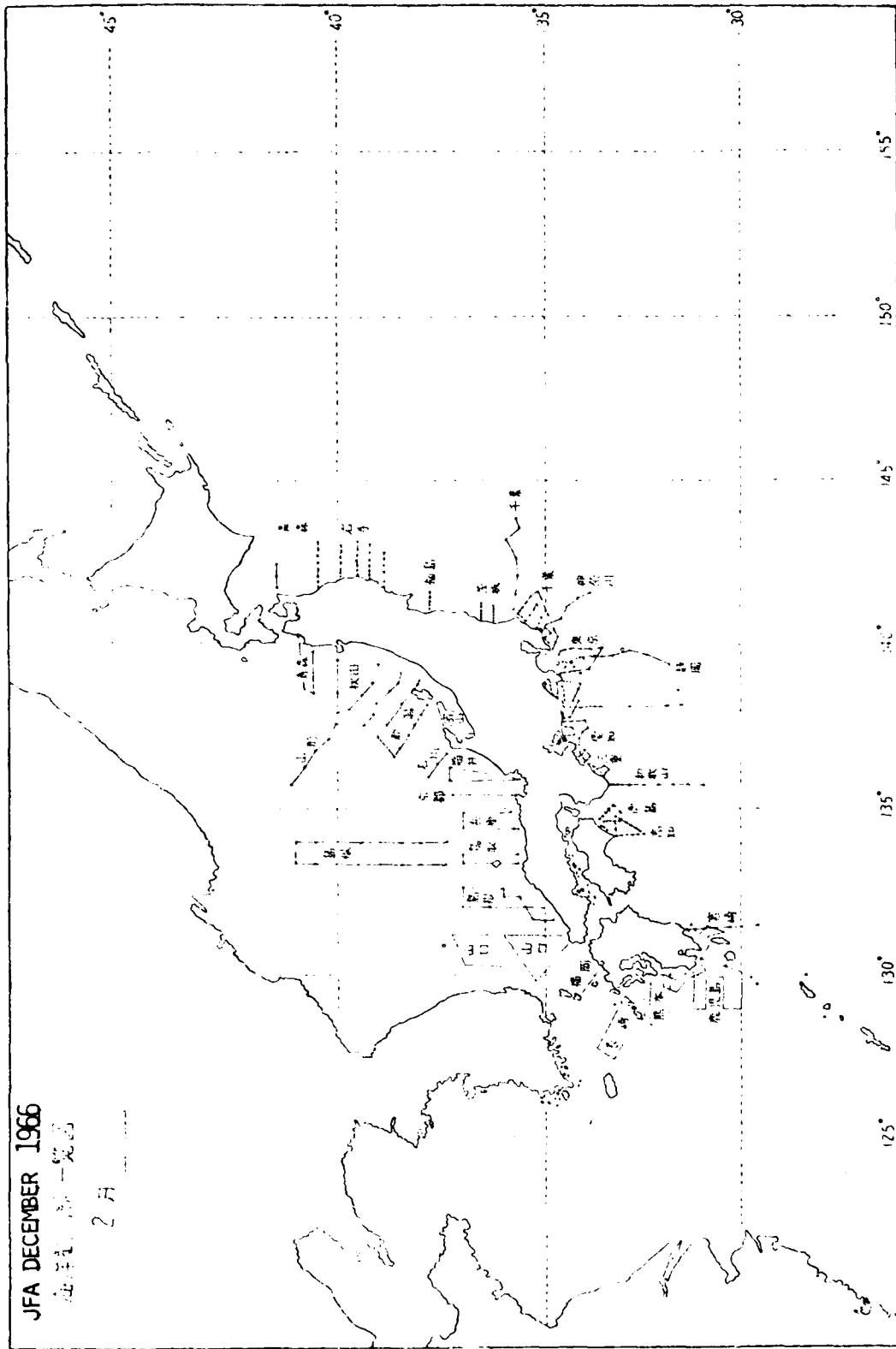


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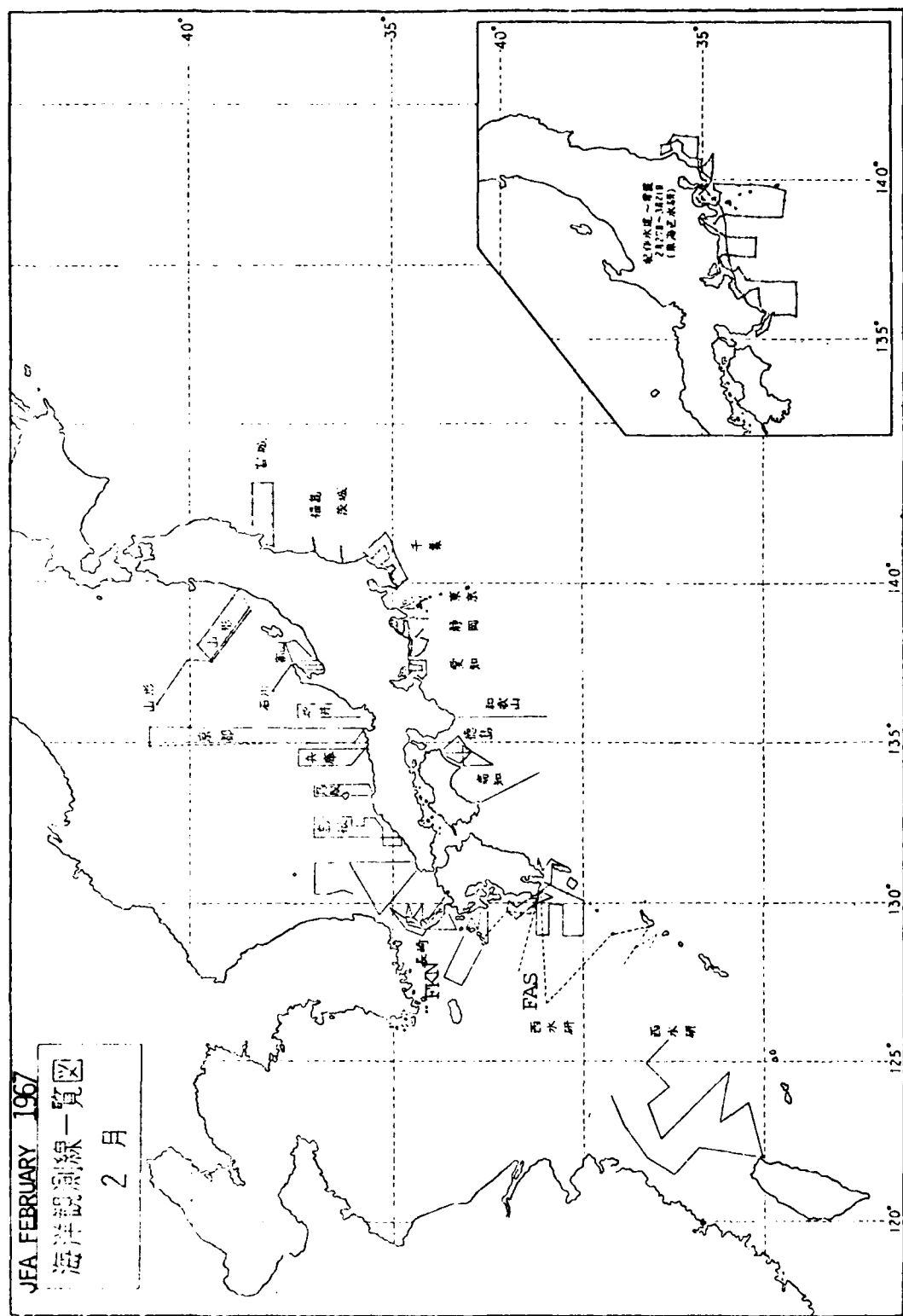


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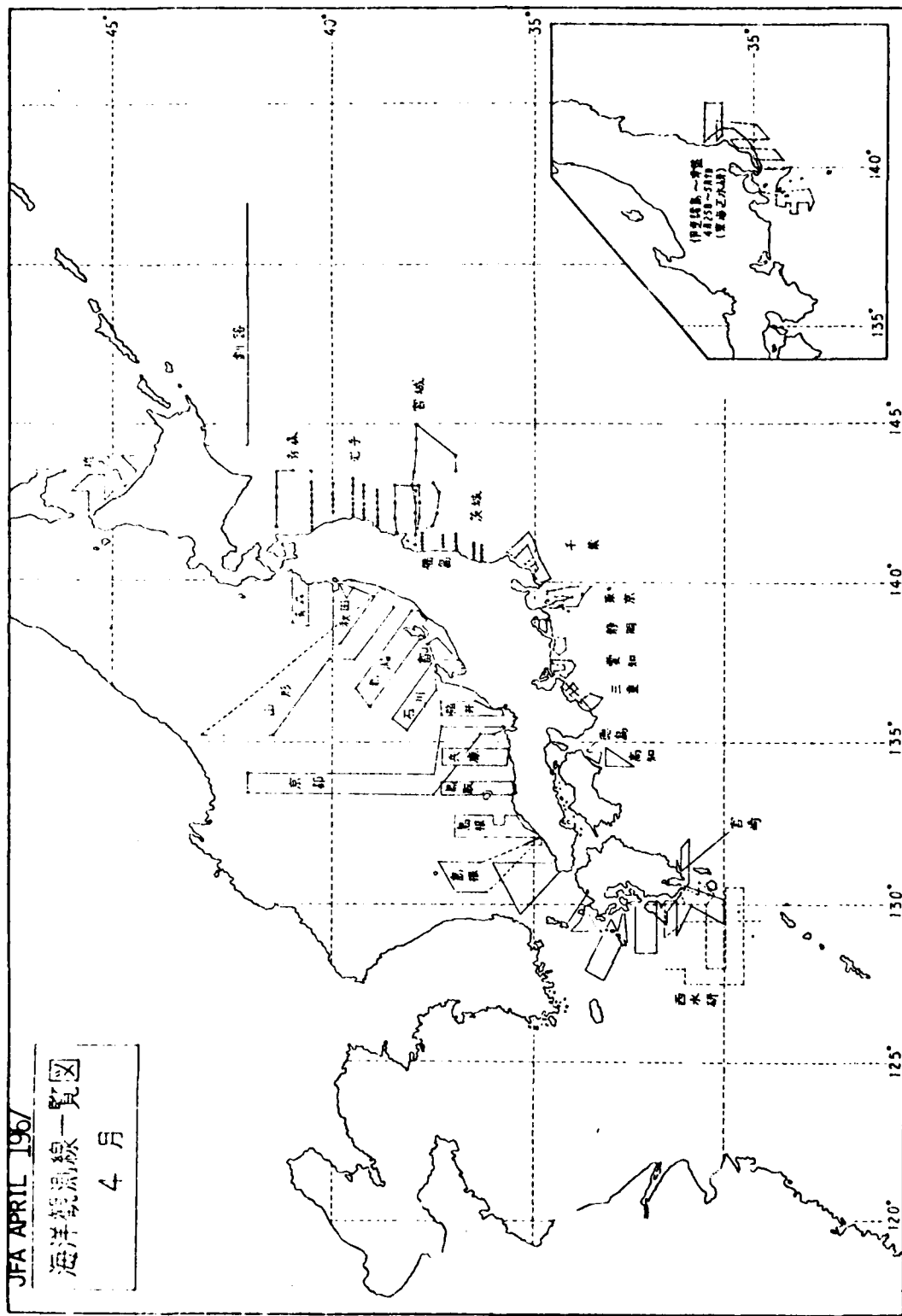




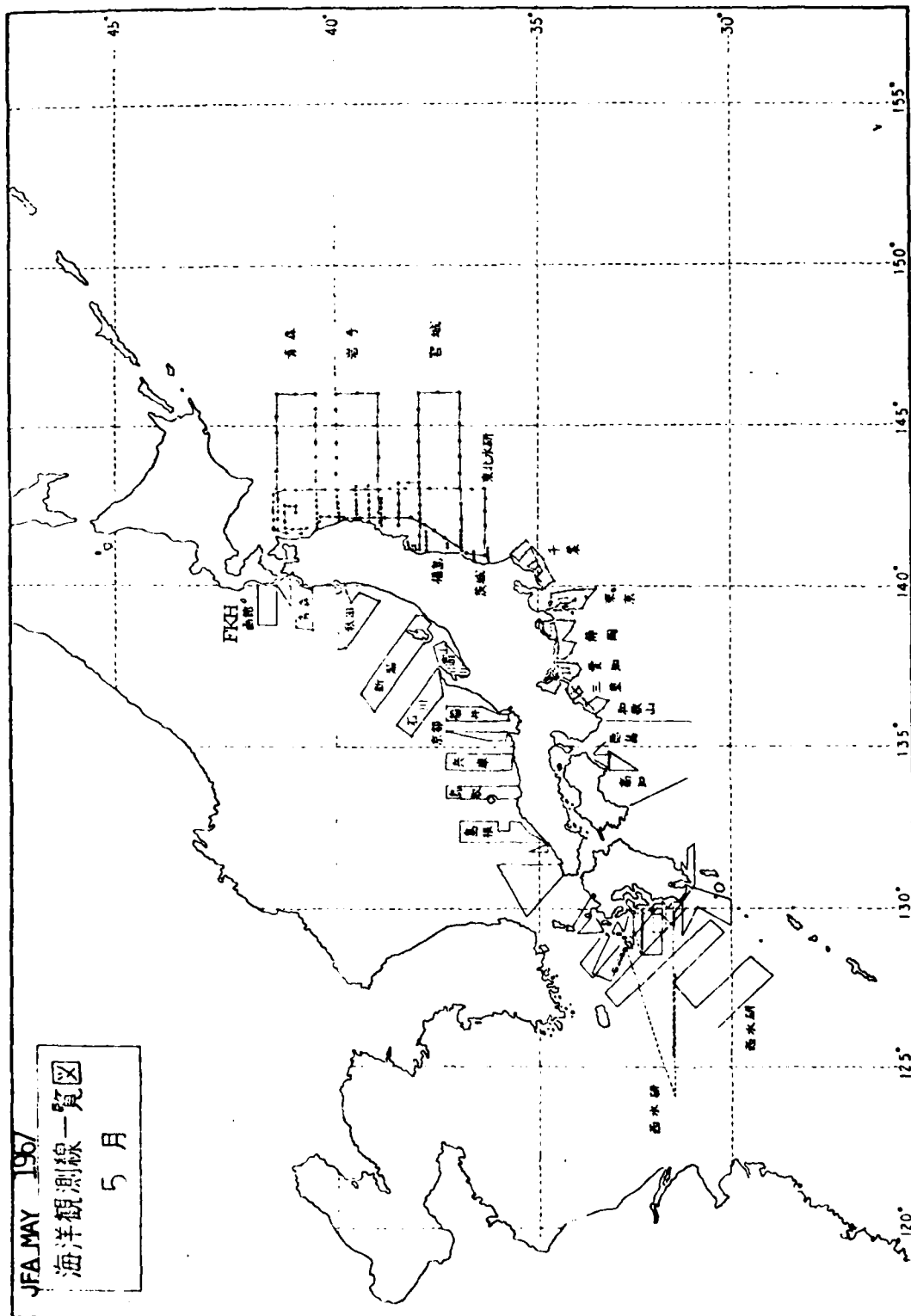
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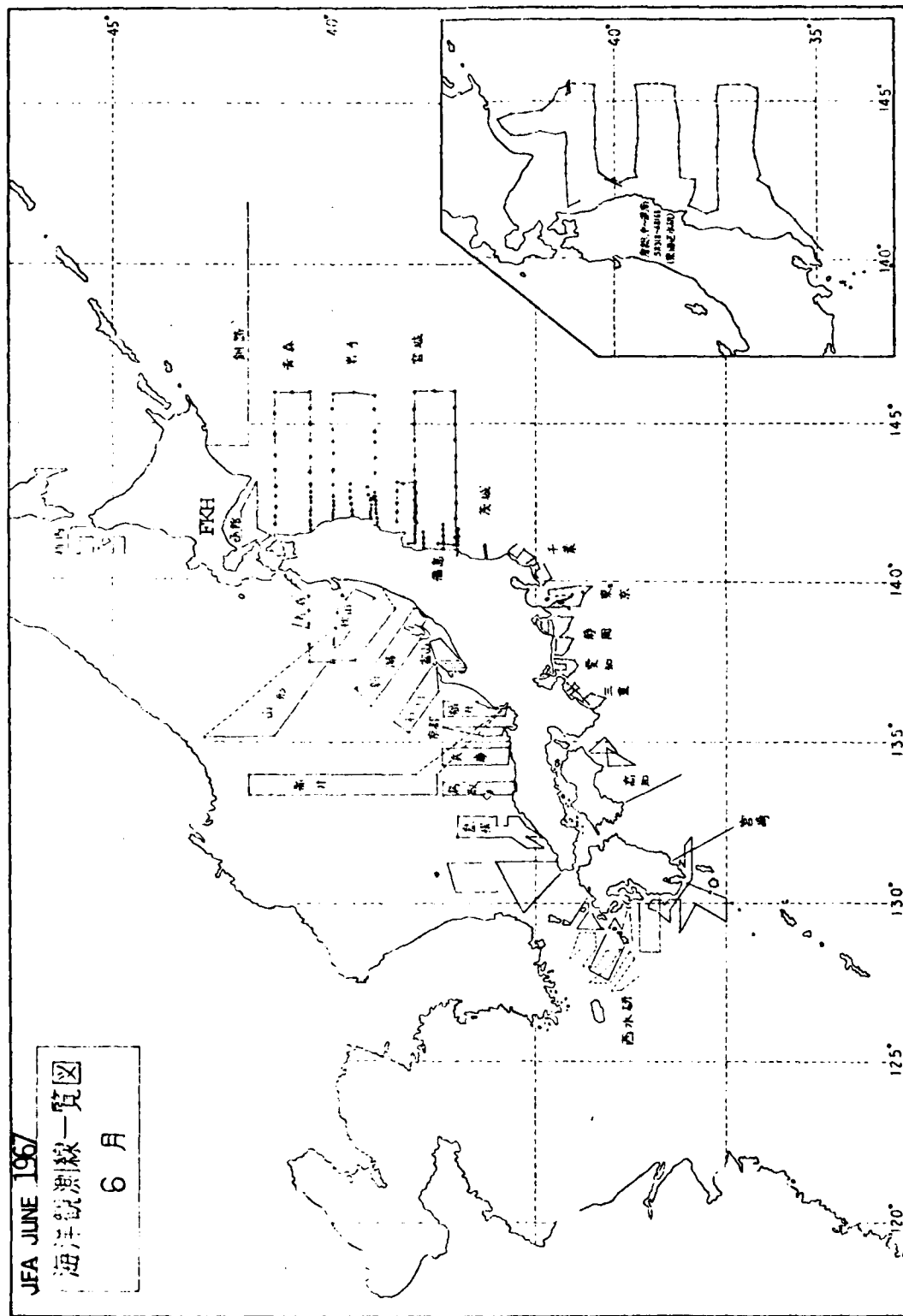
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967



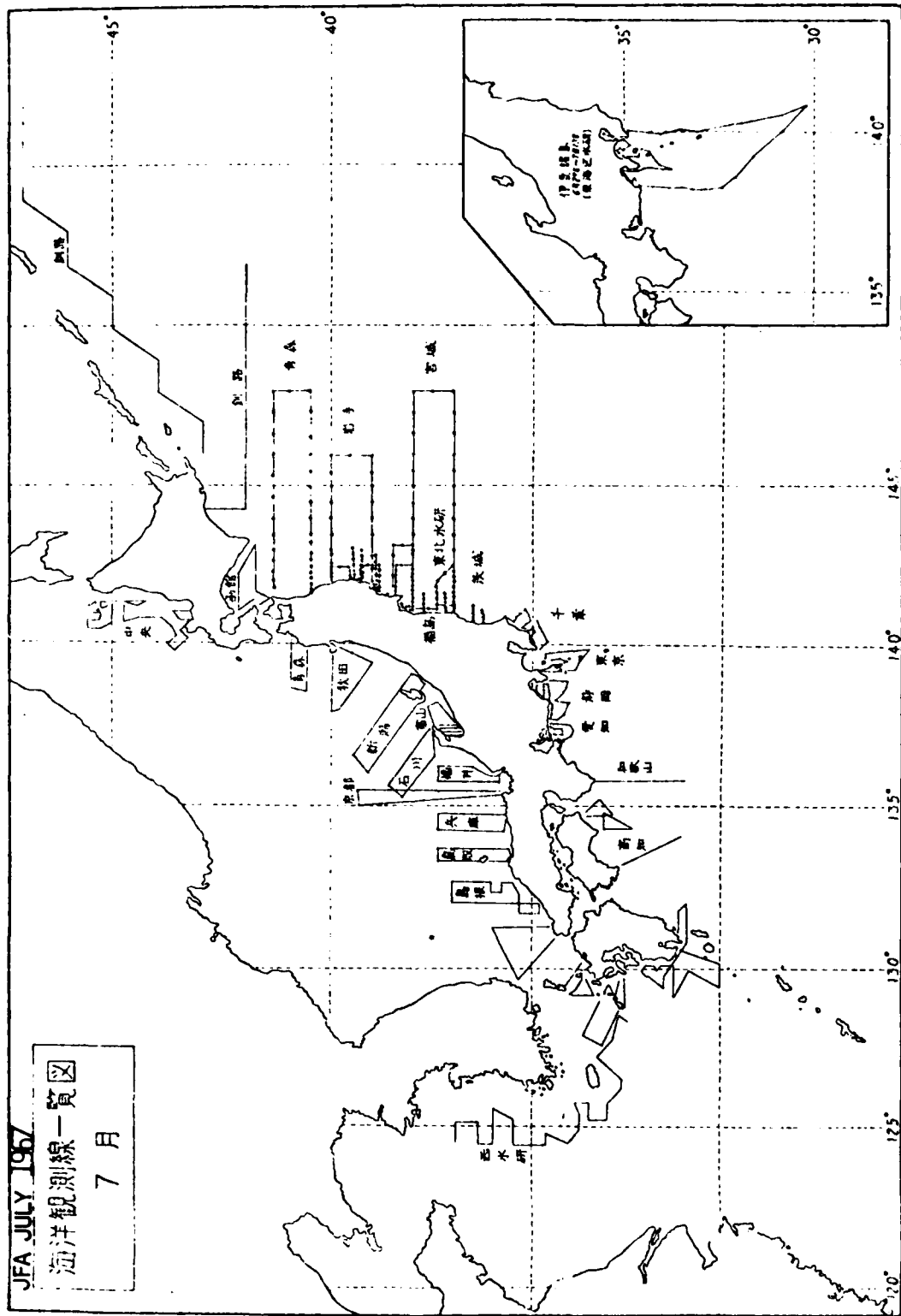
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967



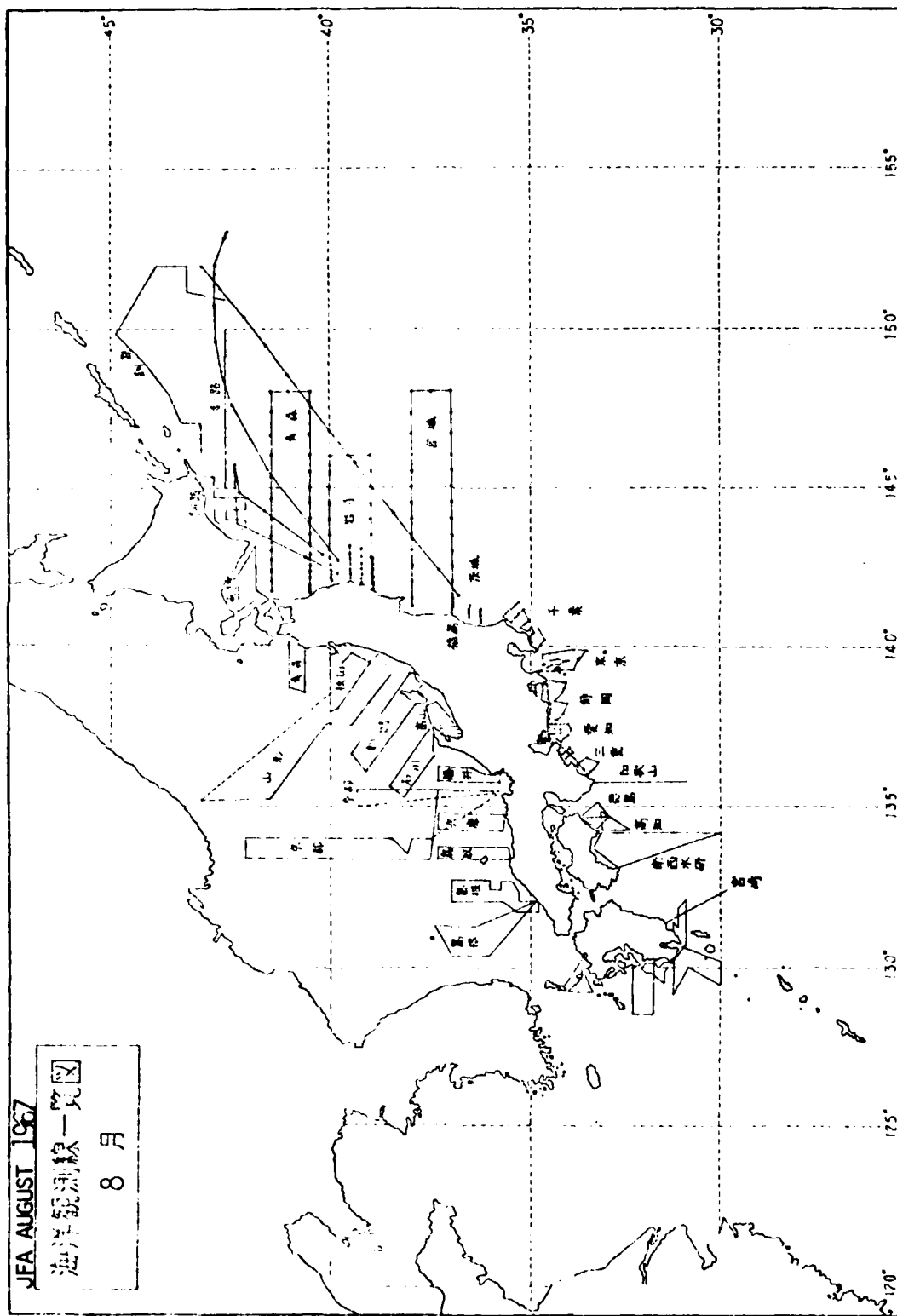
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967

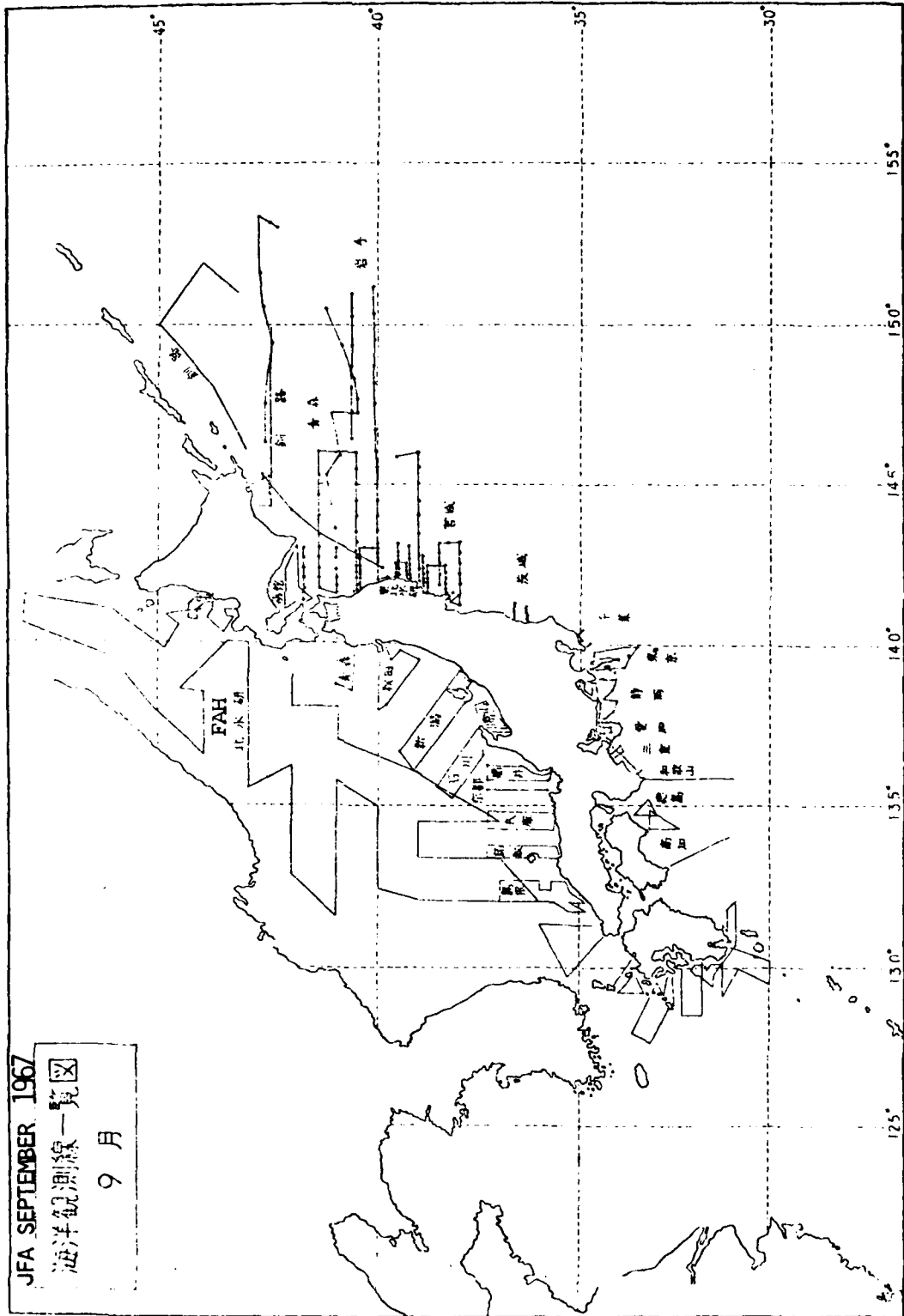


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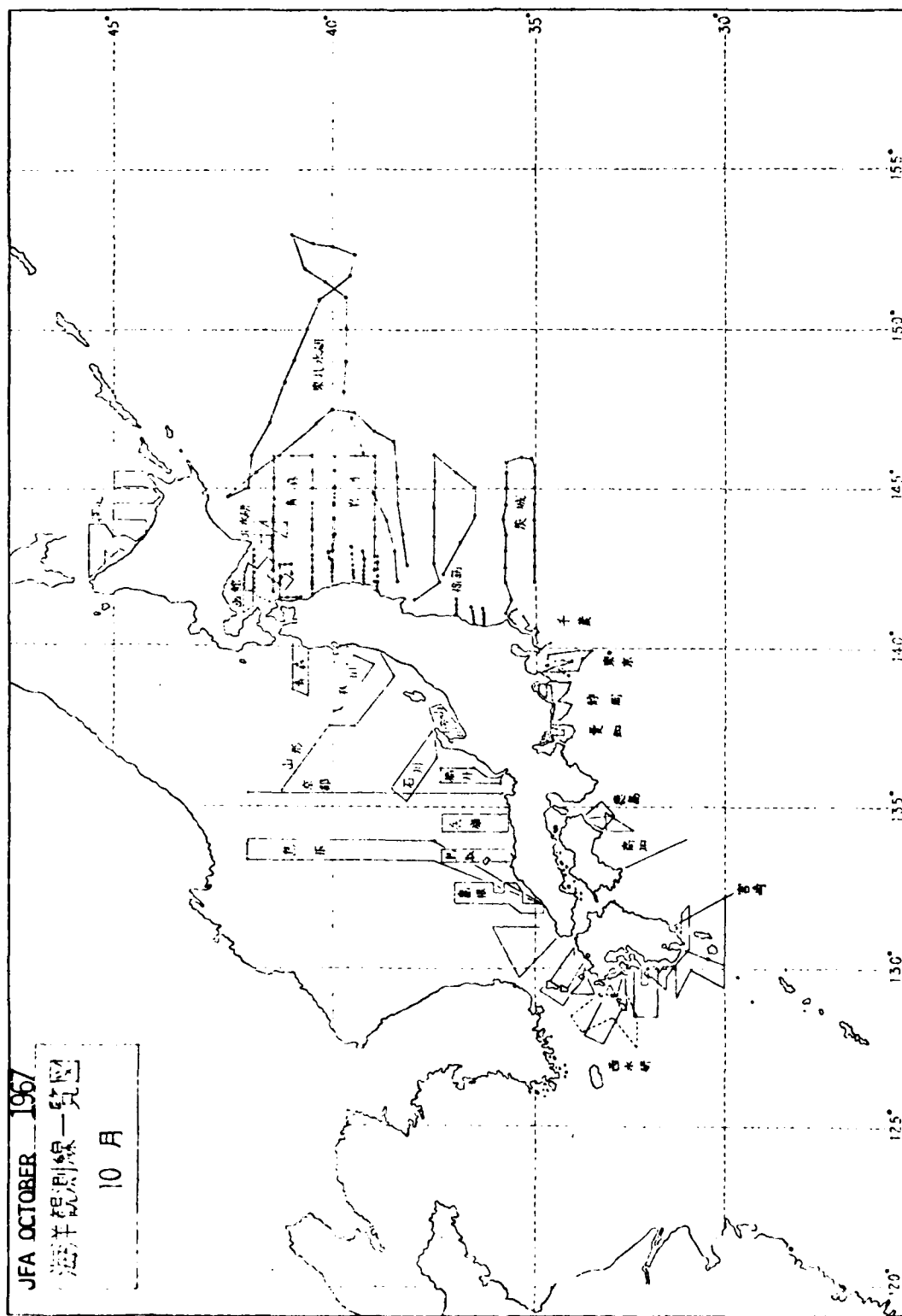
JFA SEPTEMBER 1967

海洋観測線一覽図

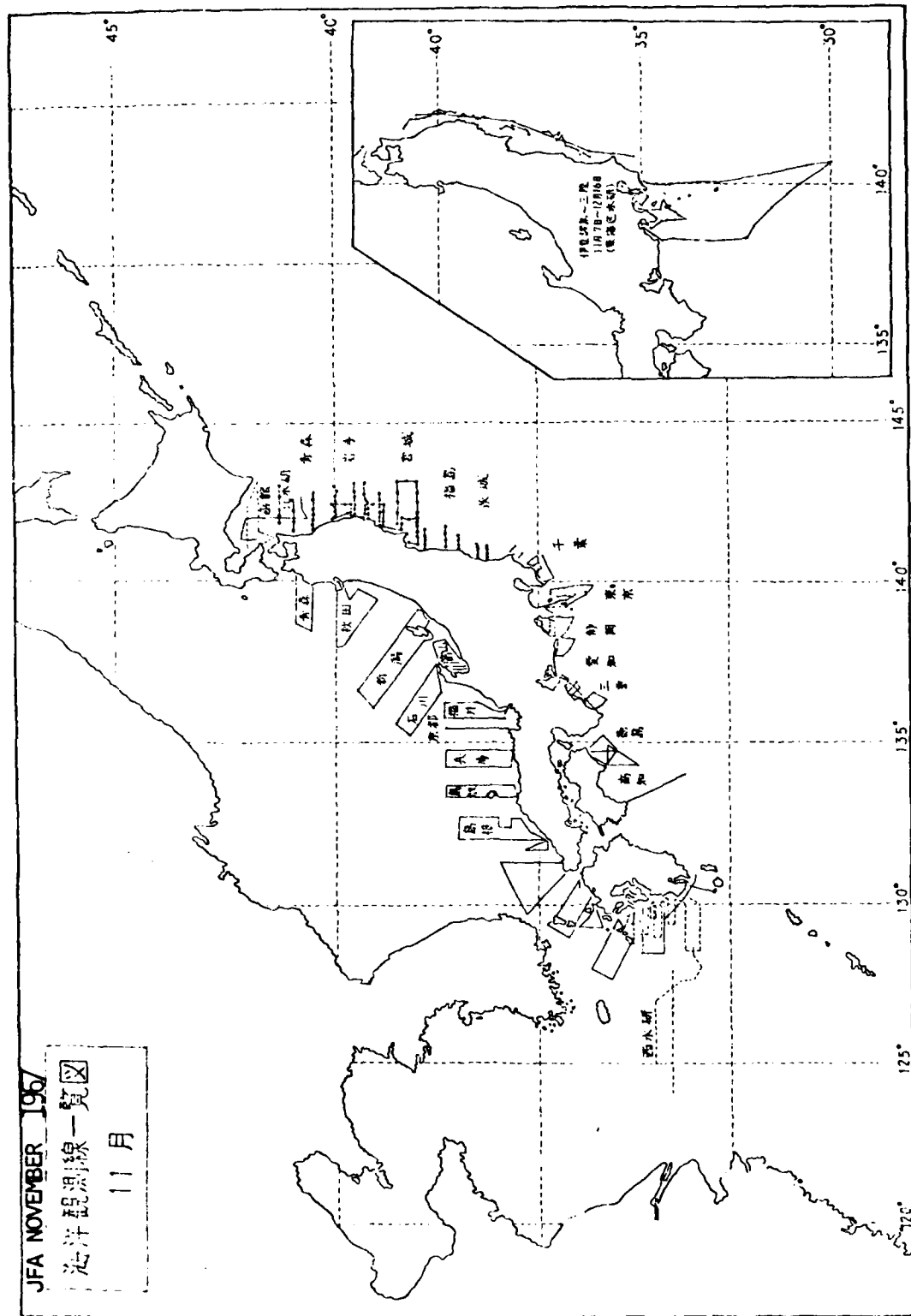
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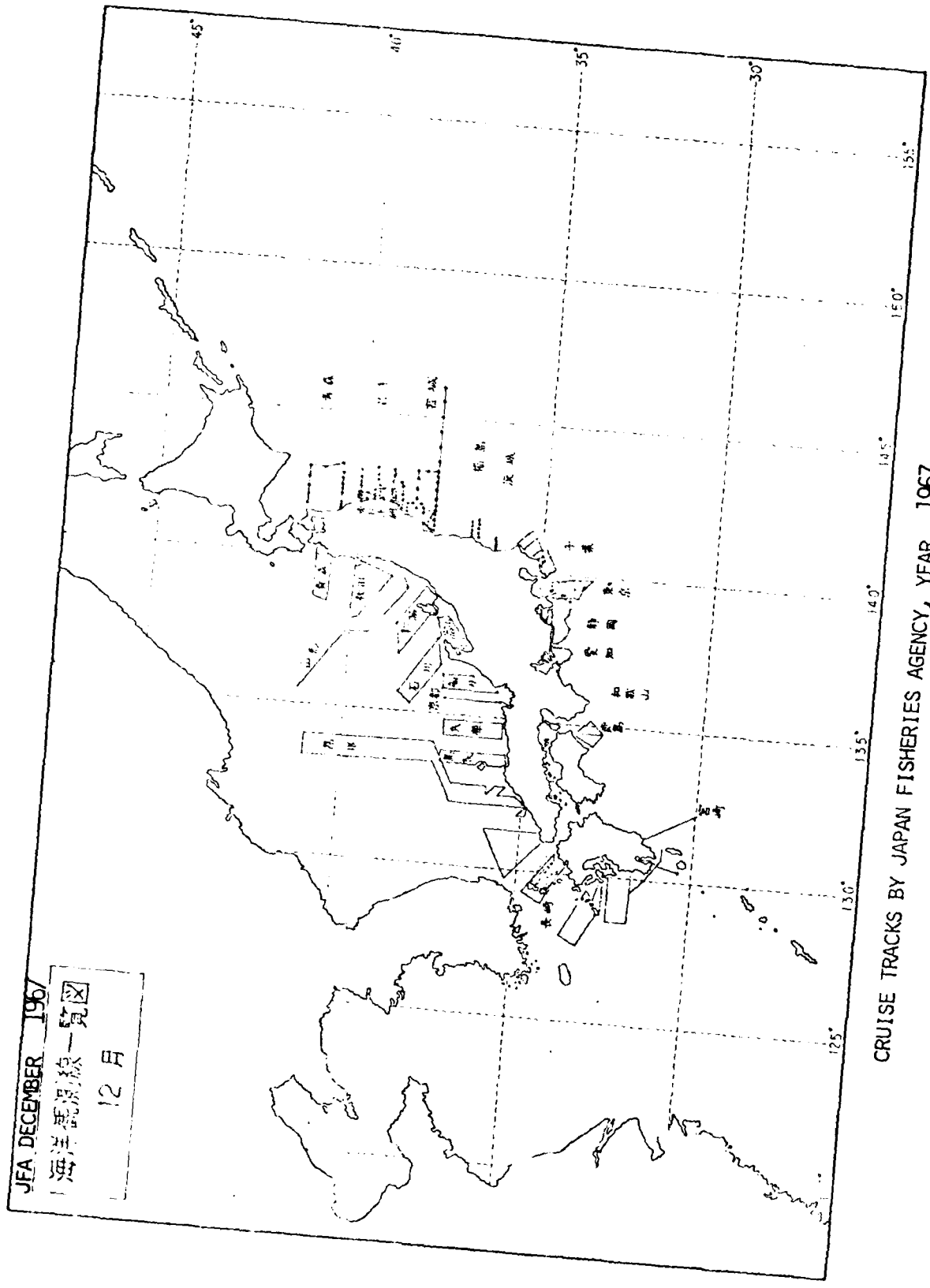
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967

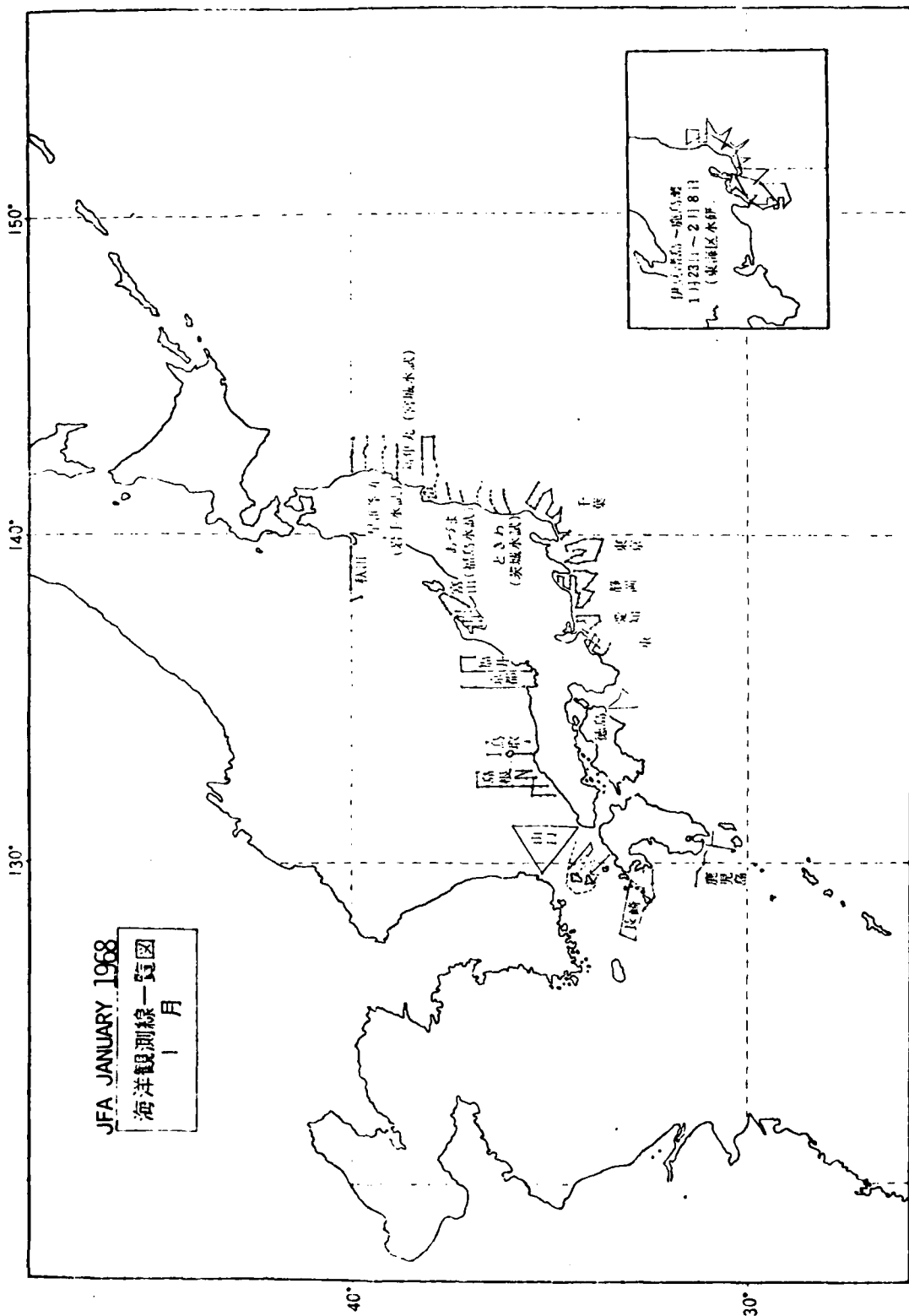


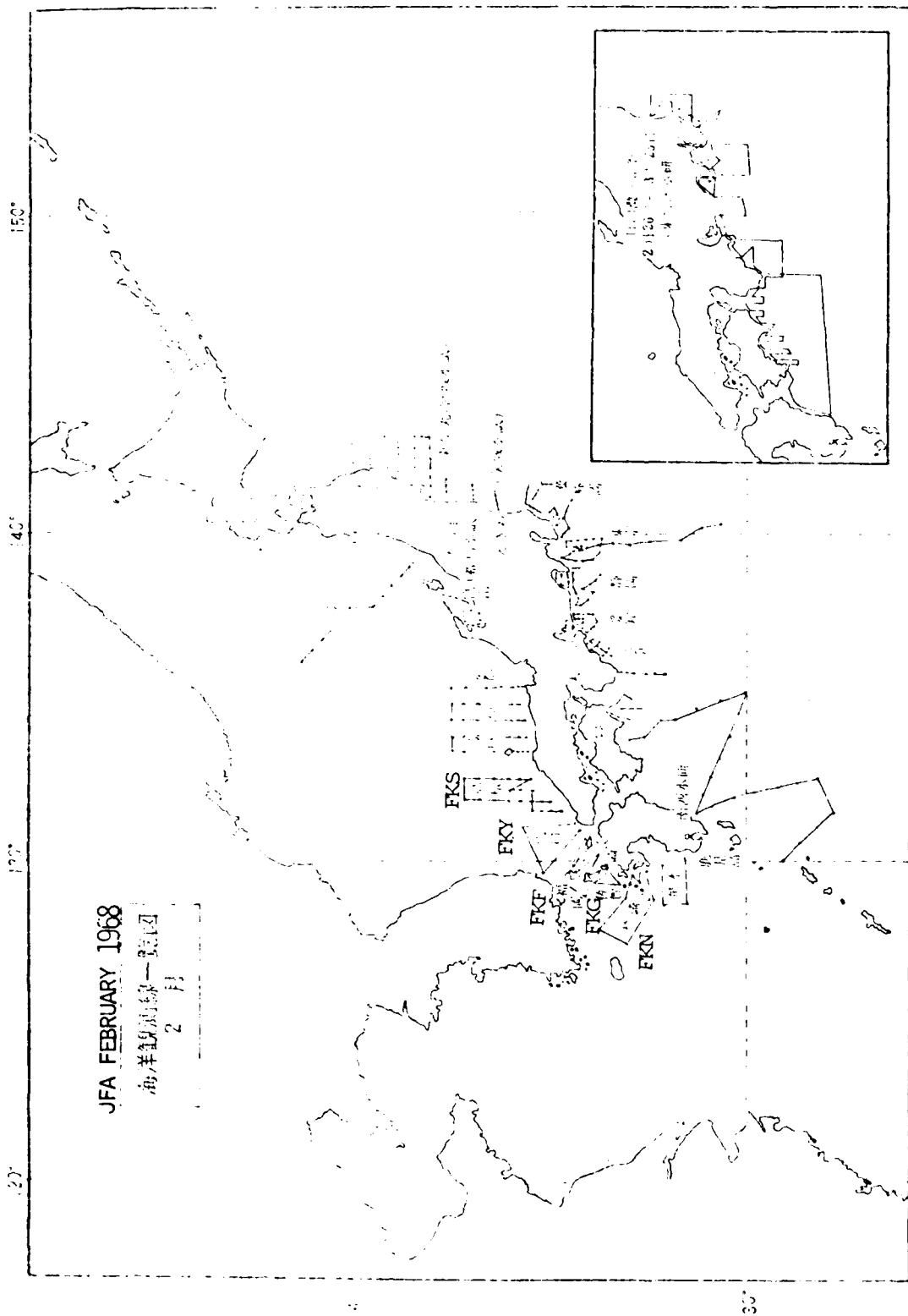
JFA NOVEMBER 1967
 海洋観測線一覽図
 11月



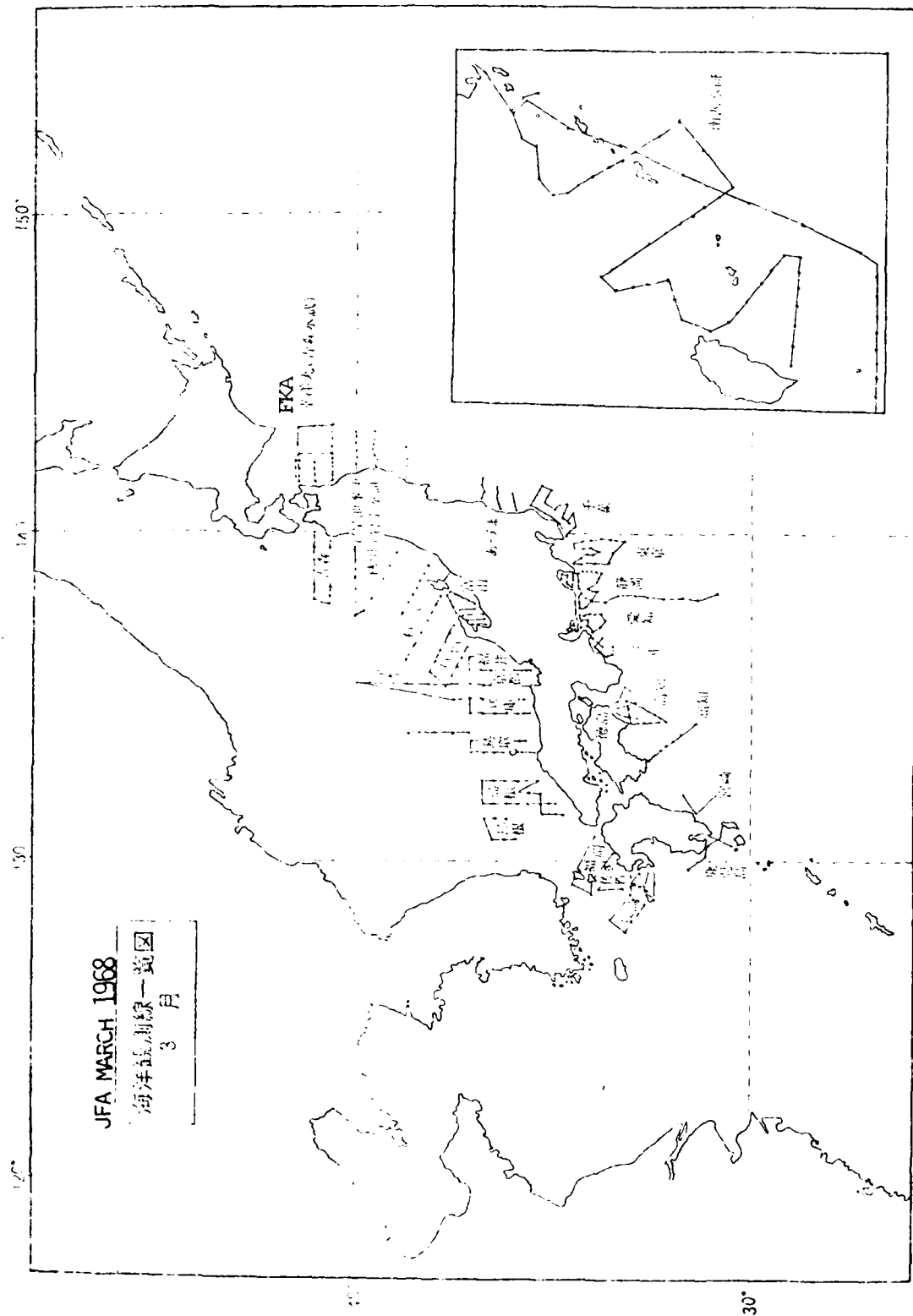
JFA DECEMBER 1967
 海洋調査線一覽図
 12月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1967

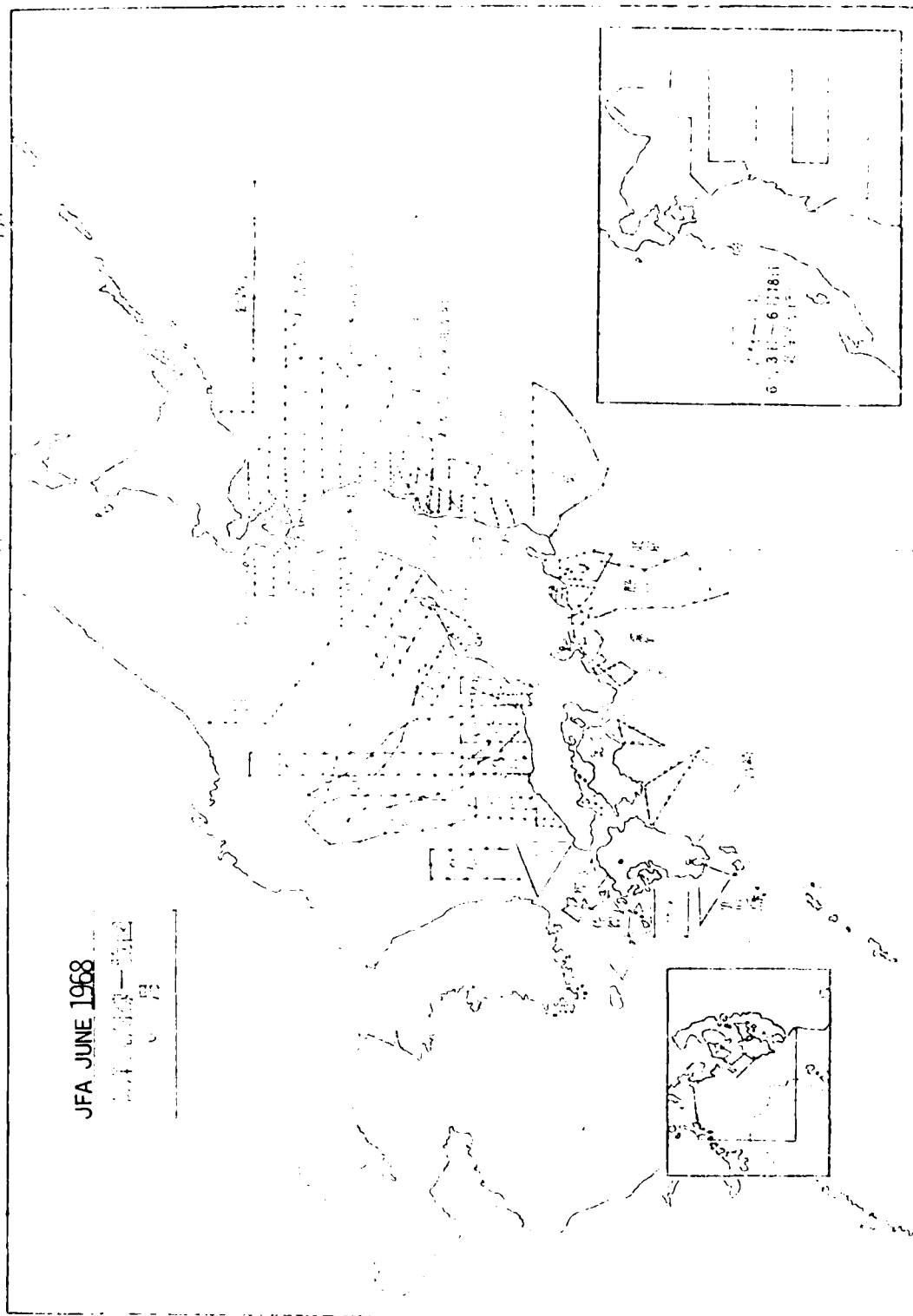




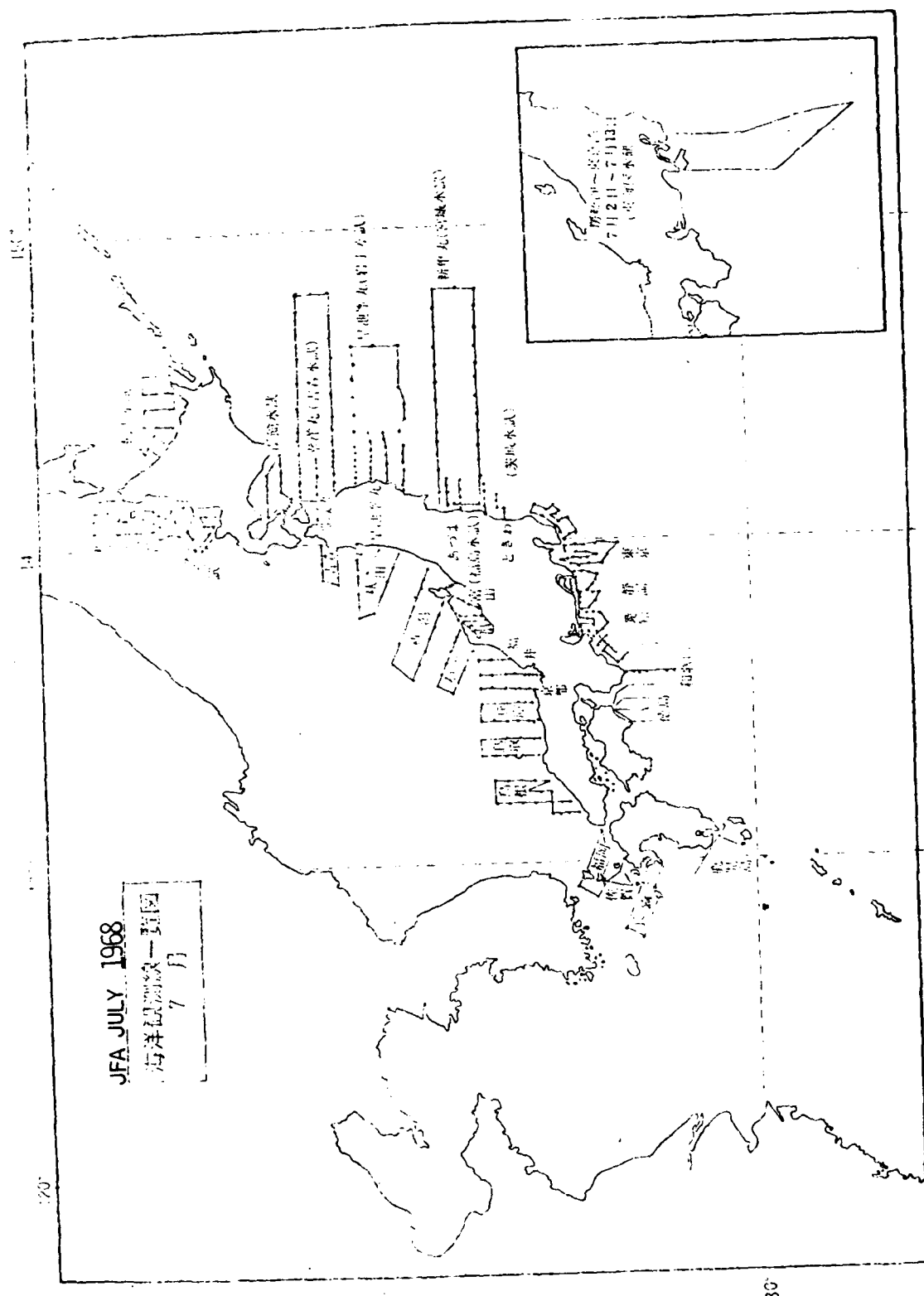
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1968



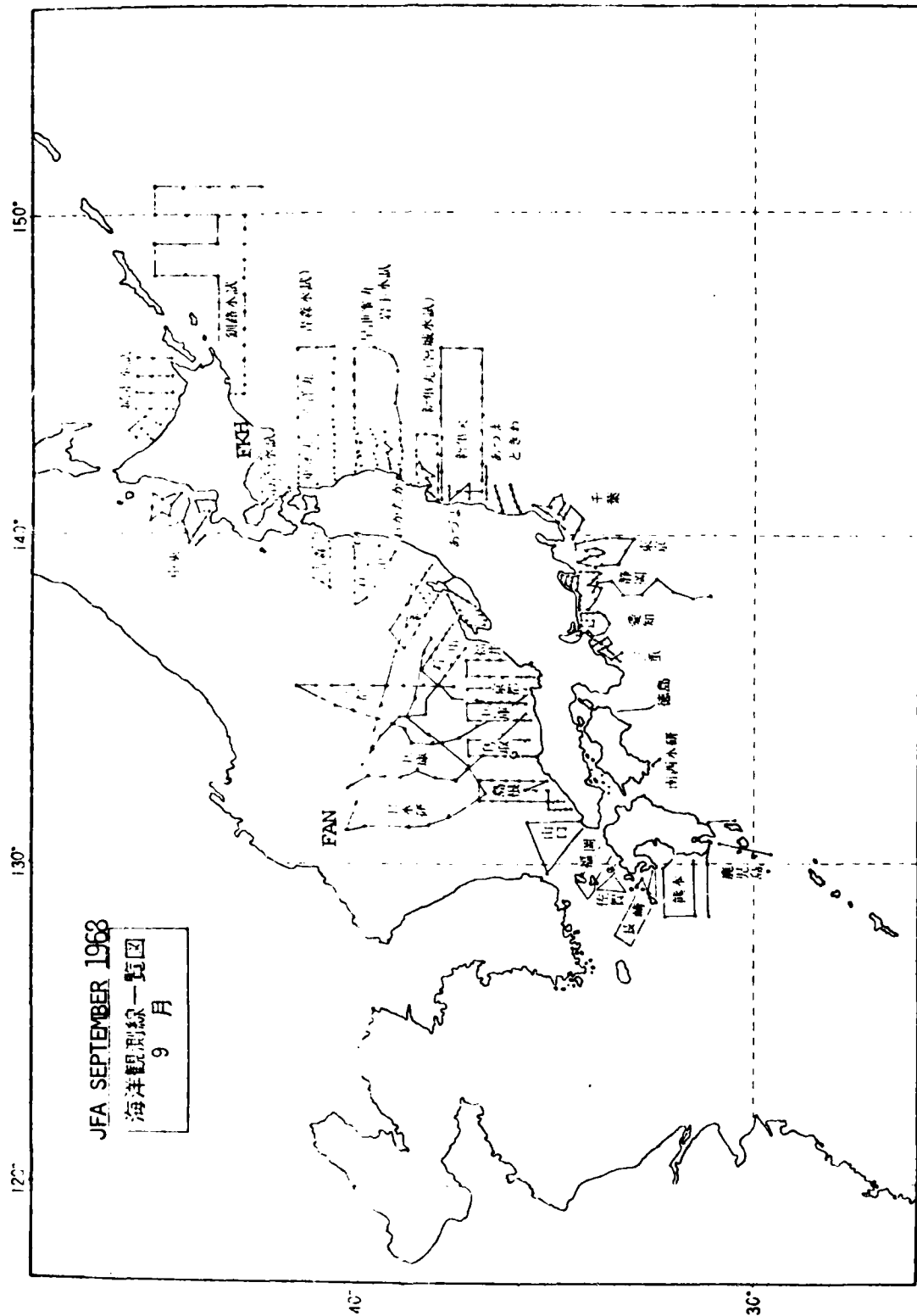
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1968



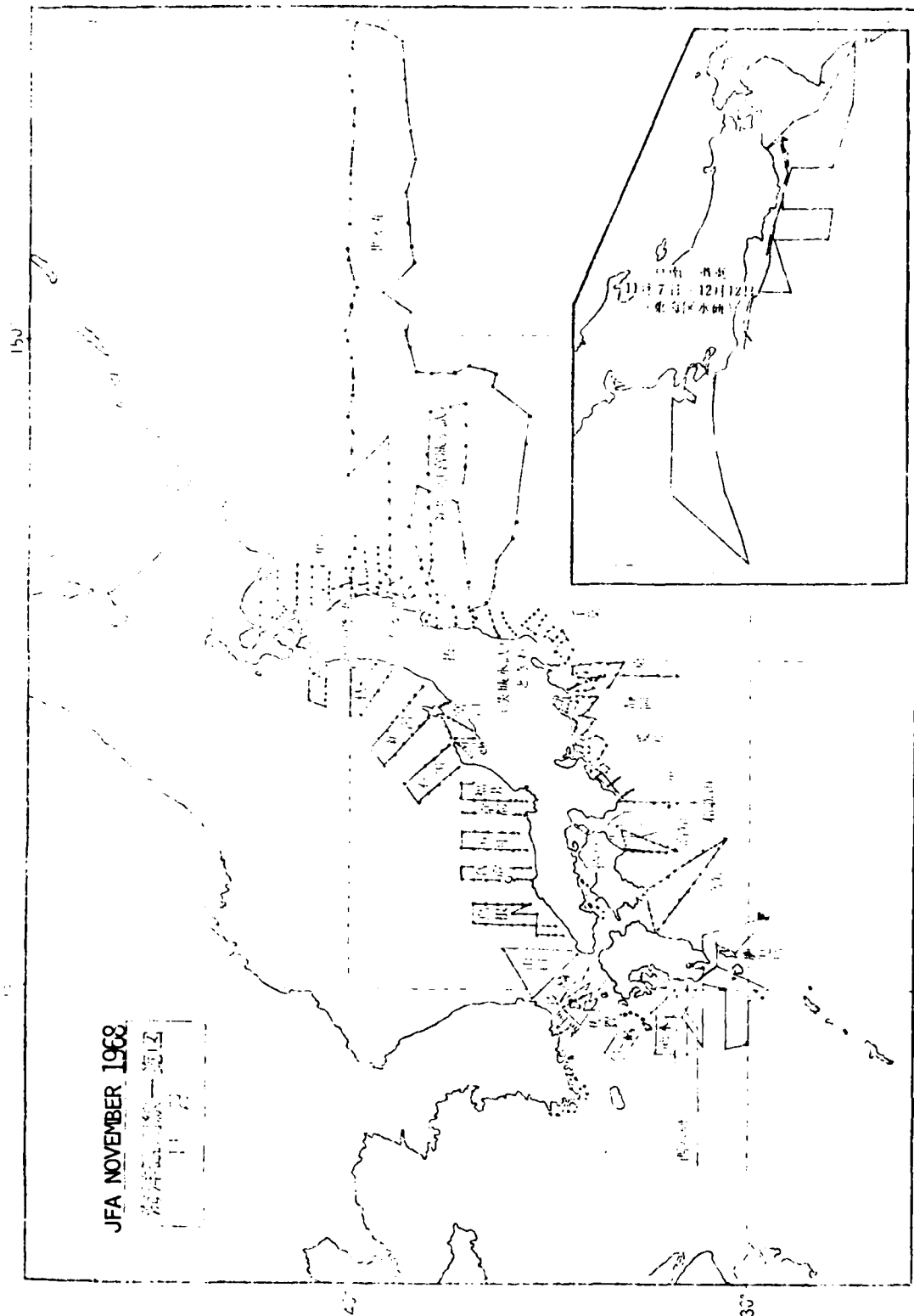
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1968



JFA JULY 1968
海洋観測船一覧図
7月

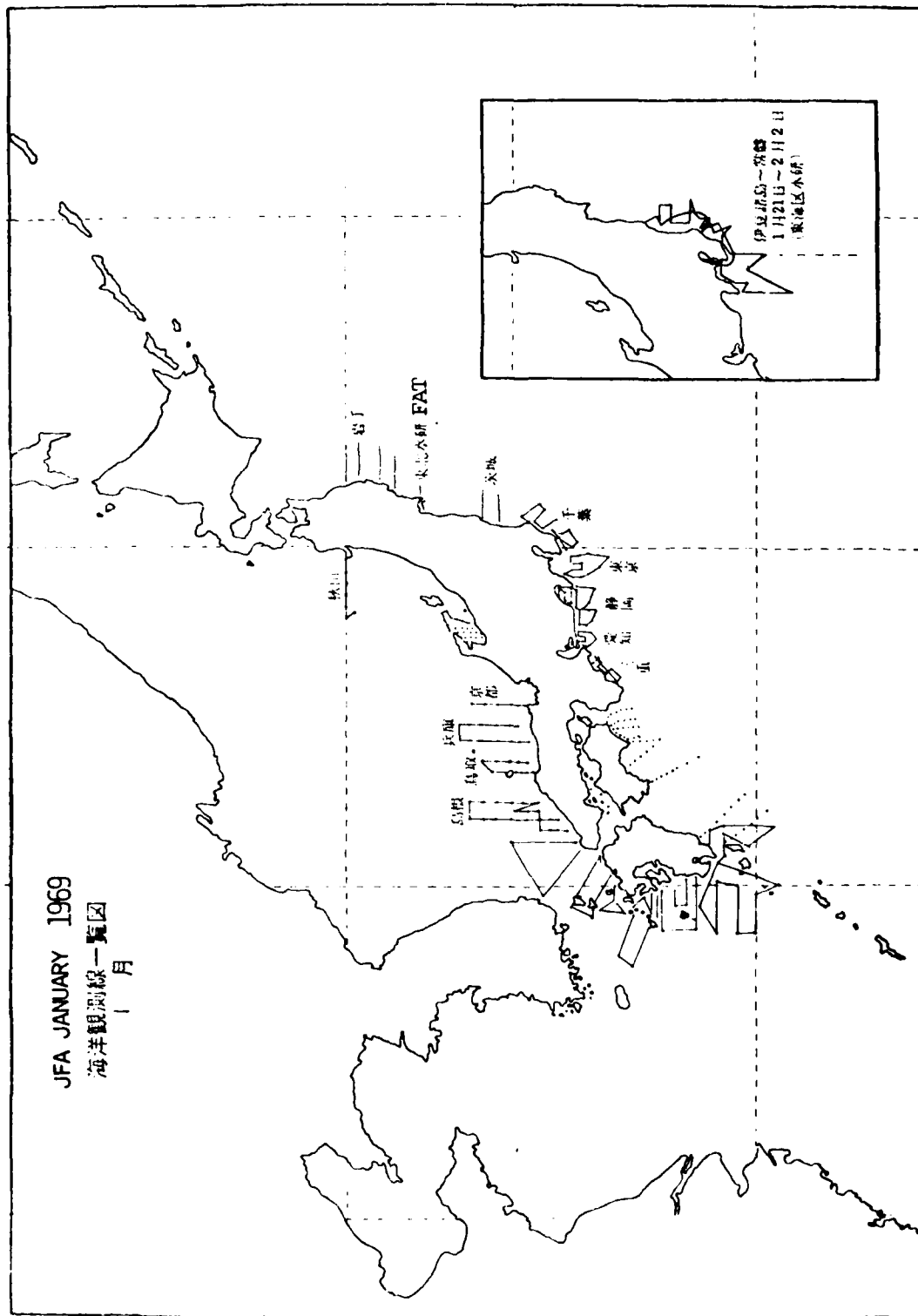


JFA SEPTEMBER 1968
 海洋観測線一覽図
 9 月

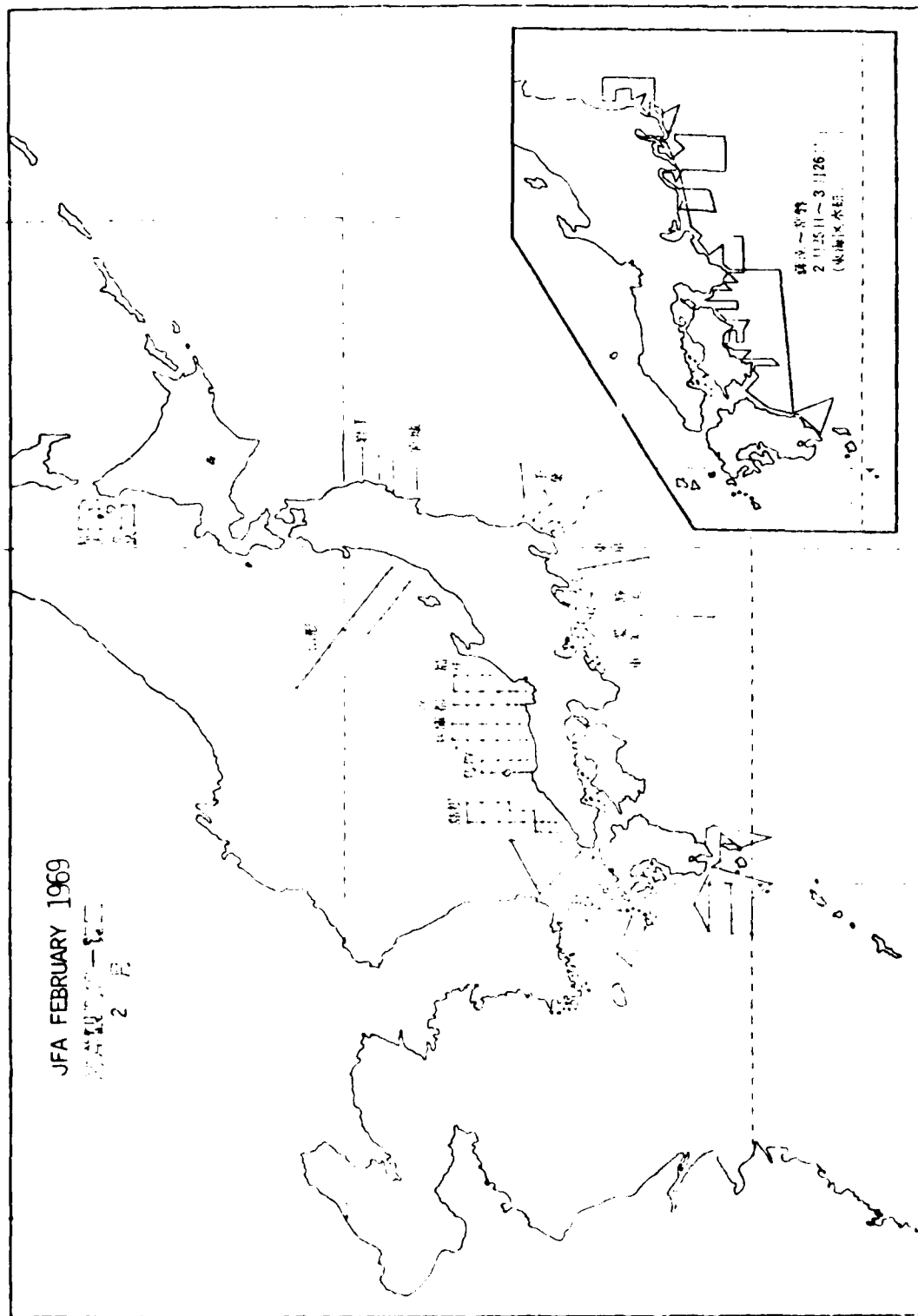


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1968

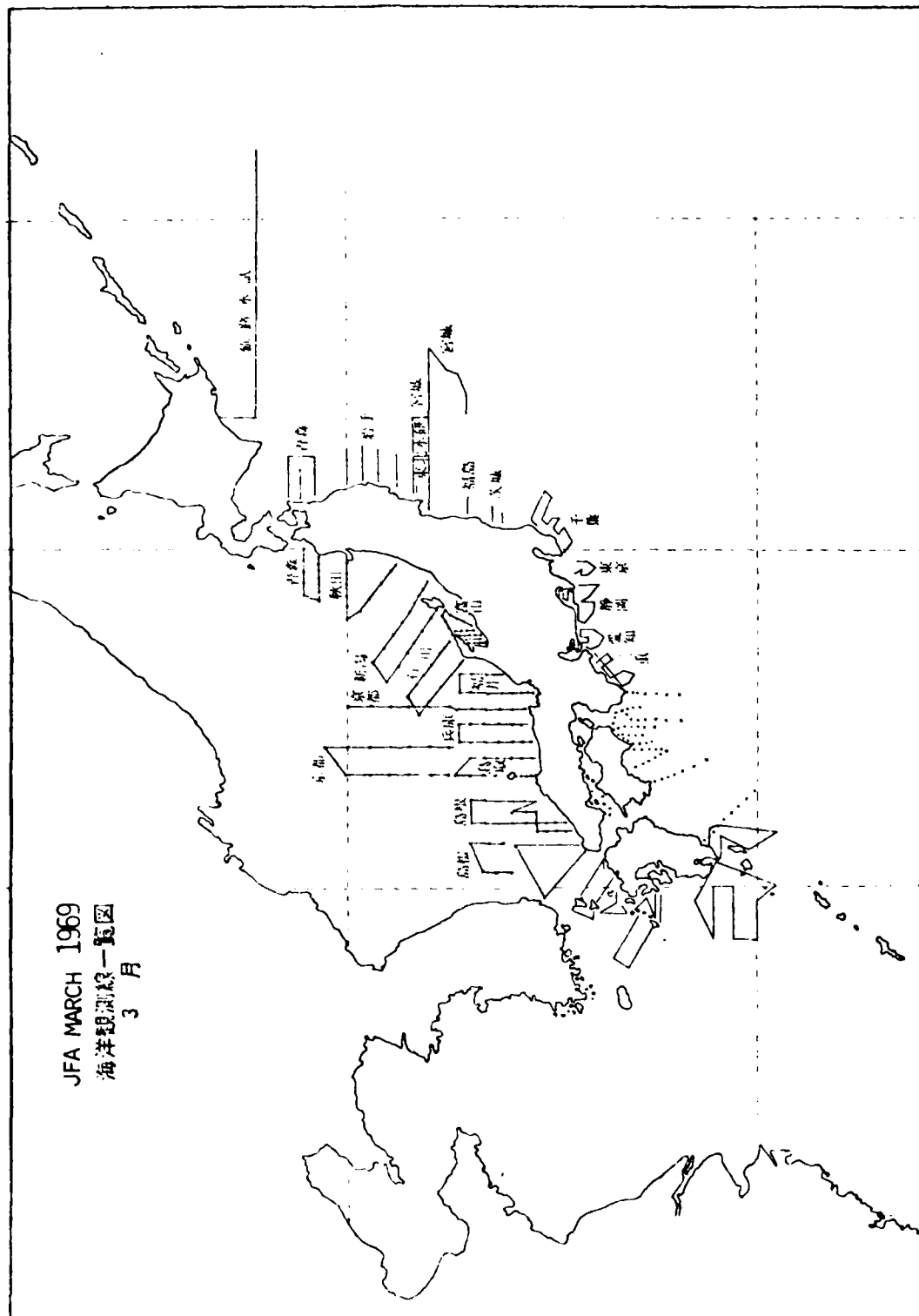
海洋觀測線一覽圖
— 月



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969

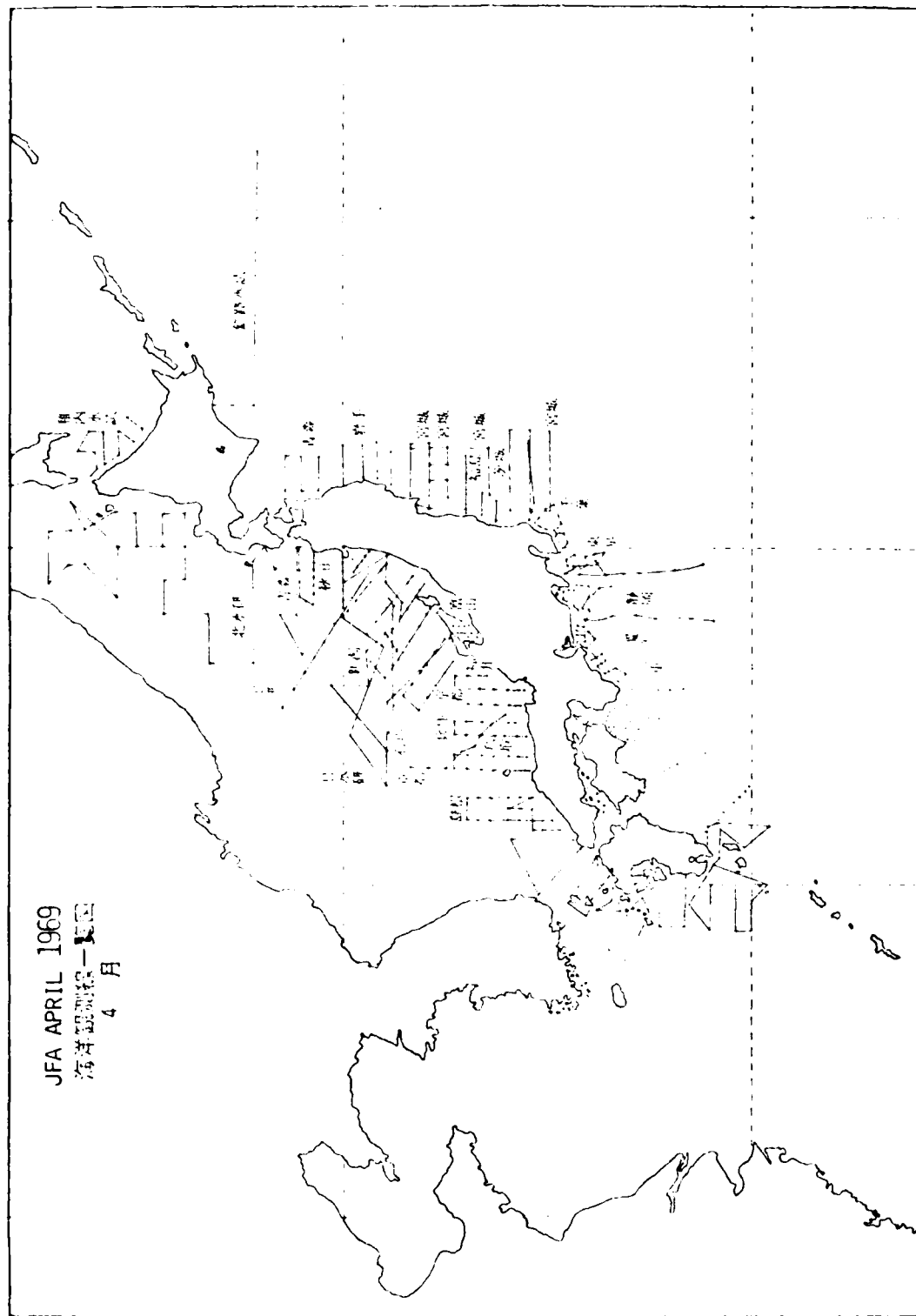


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969

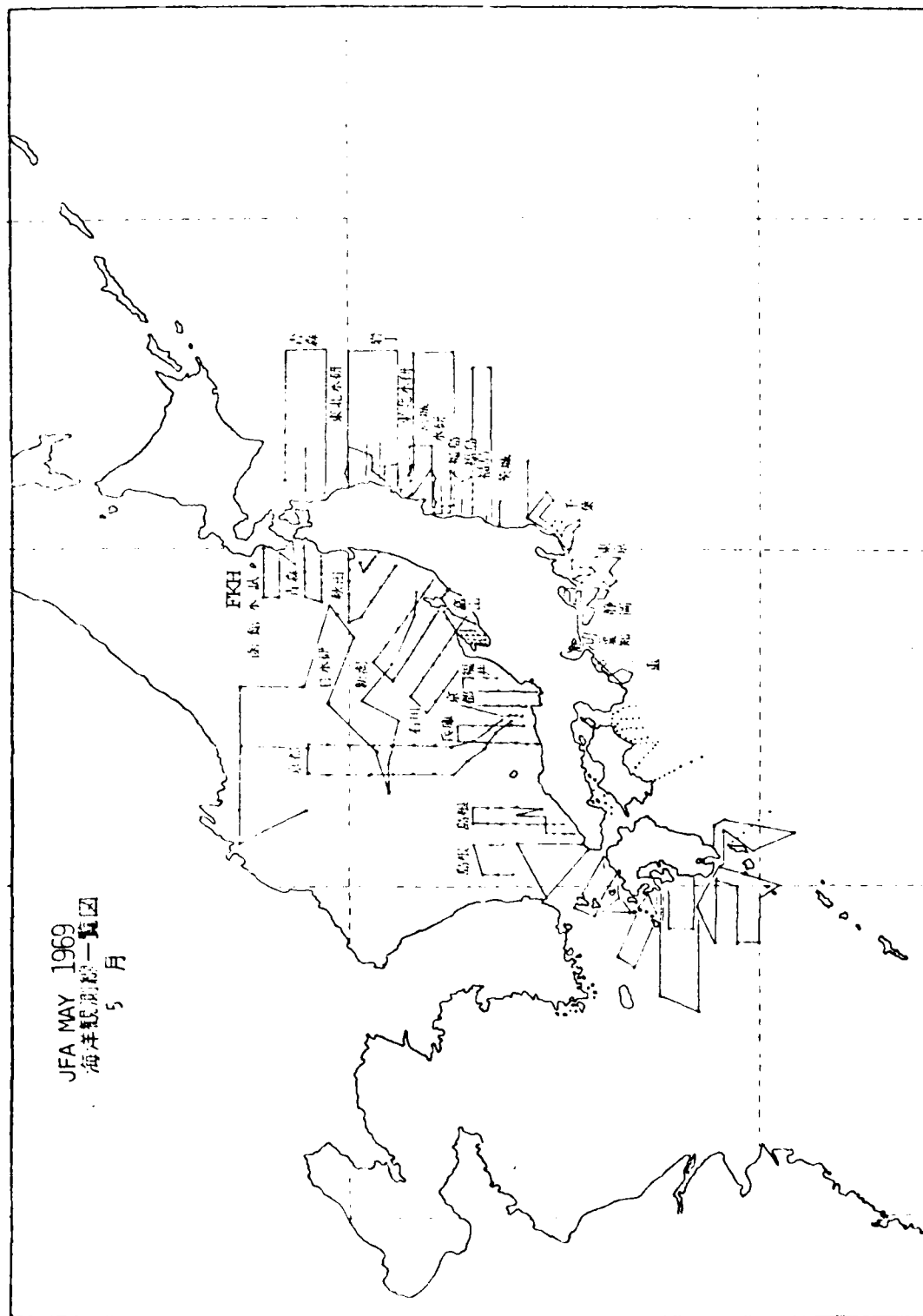


JFA MARCH 1969
海洋観測線一覽圖
3 月

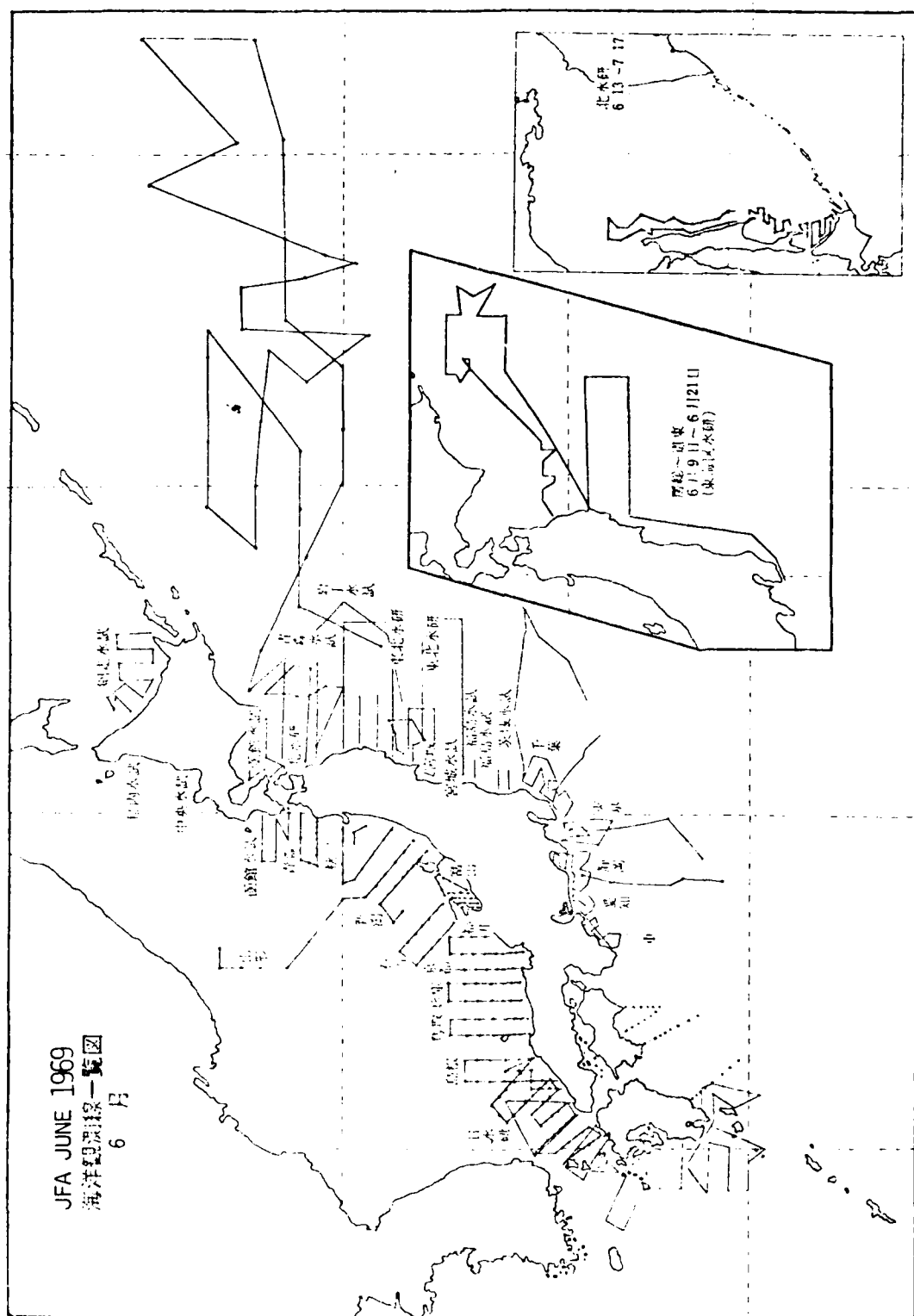
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969



JFA MAY 1969
 海洋観測第一号
 5月



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1960

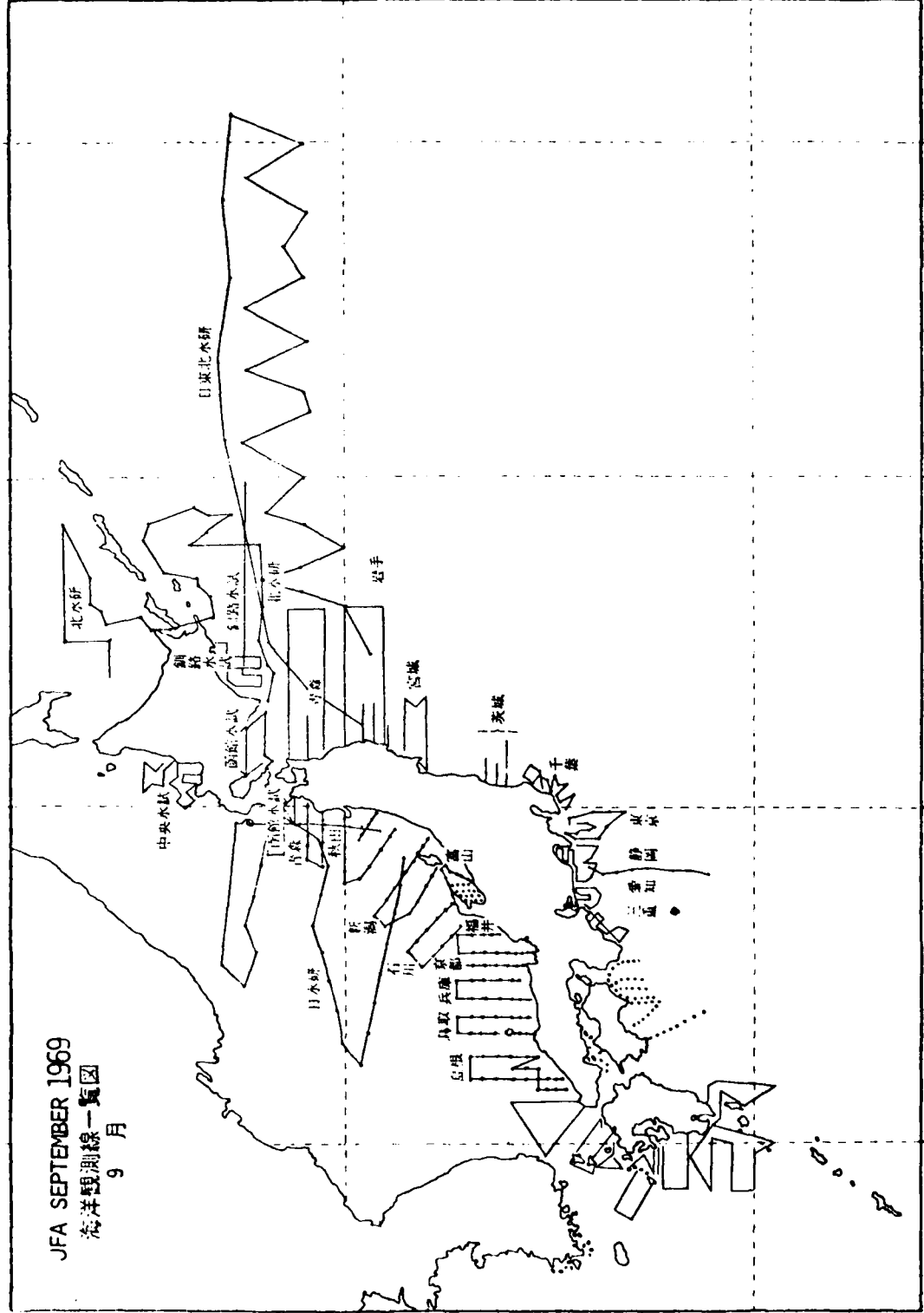
JFA AUGUST 1969
海洋観測線一覽図
8月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969

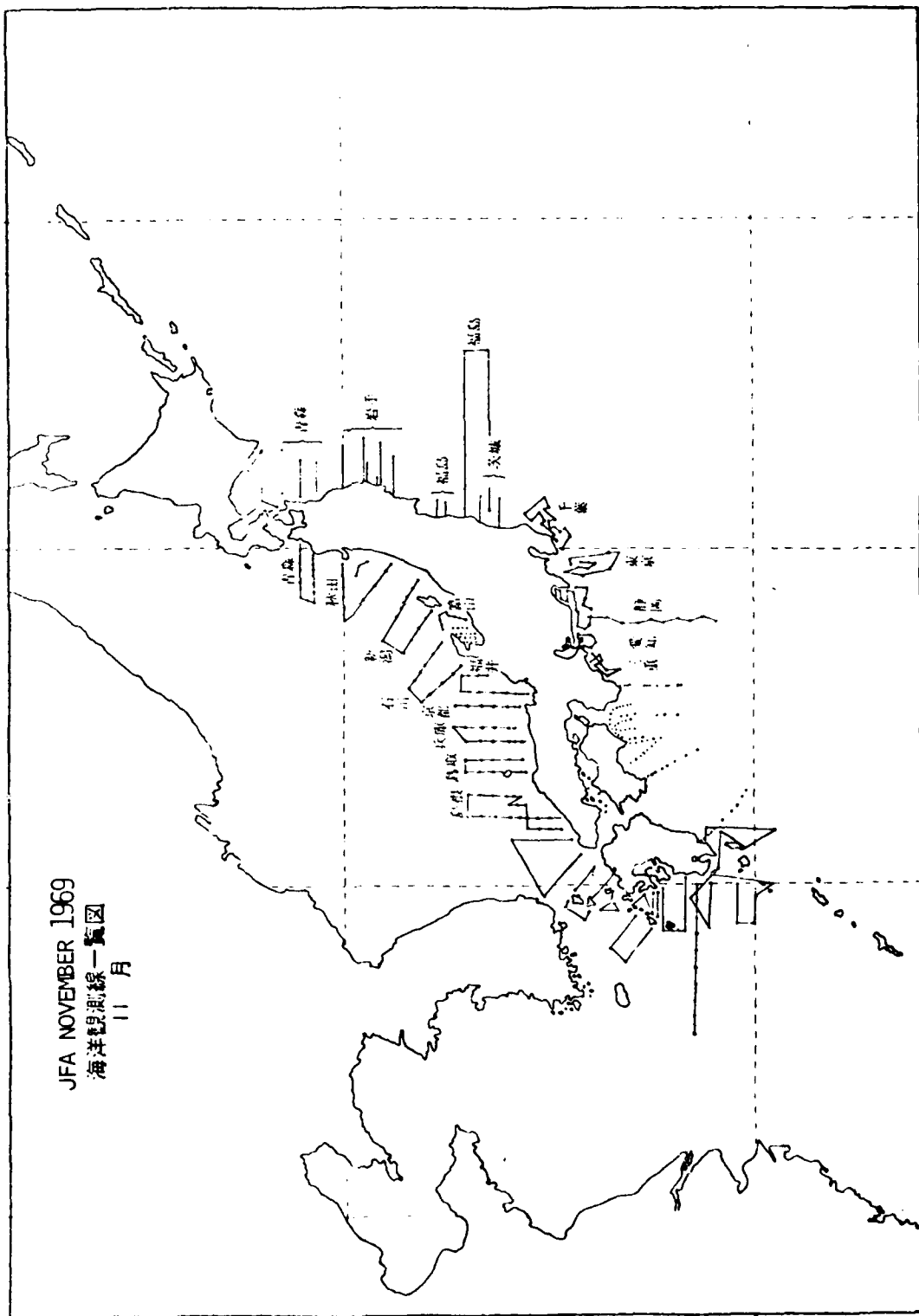
JFA SEPTEMBER 1969

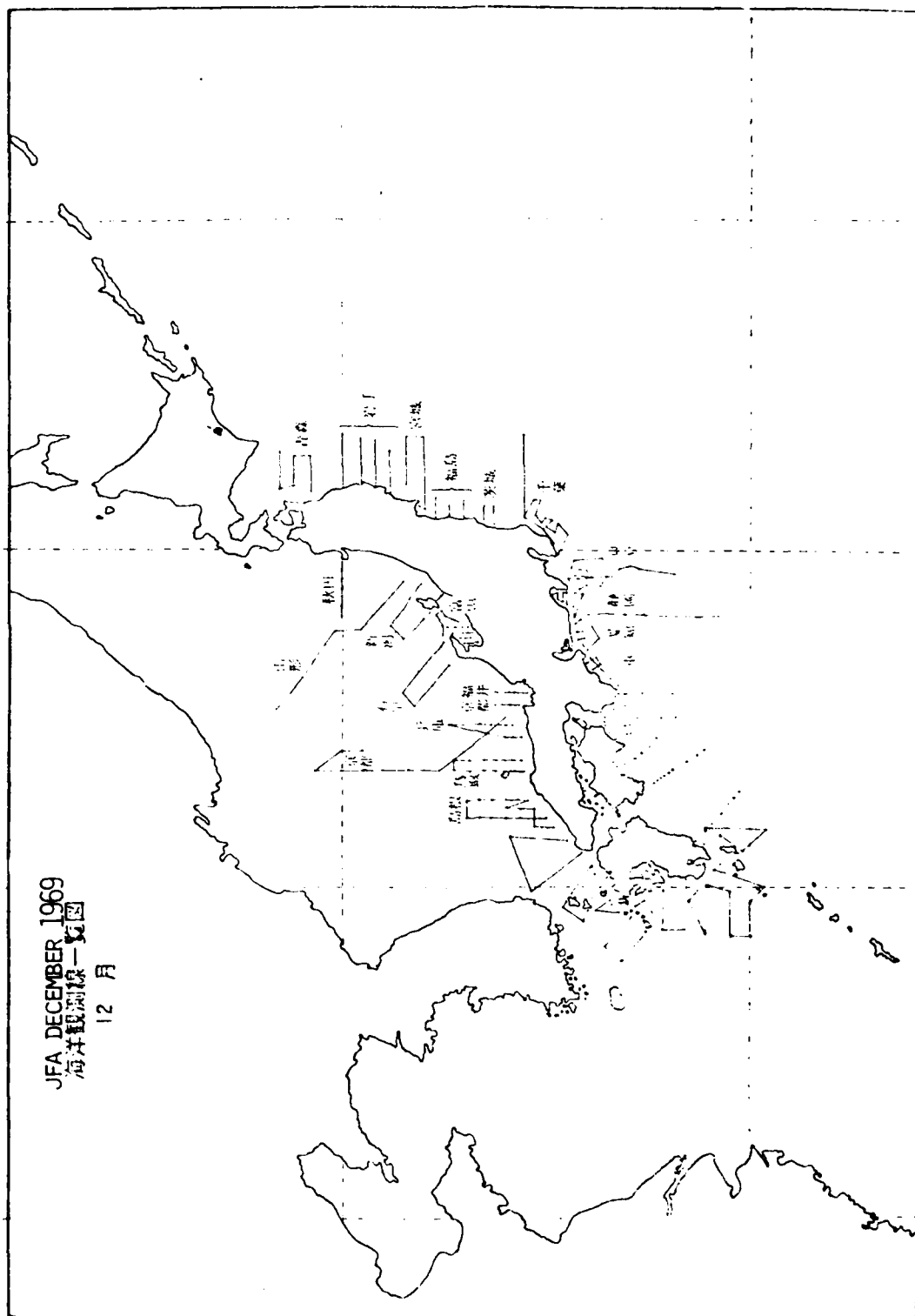
海洋観測線一覽図

9 月



東京湾～豆座
10月3日～10月16日
(東海国水庁)

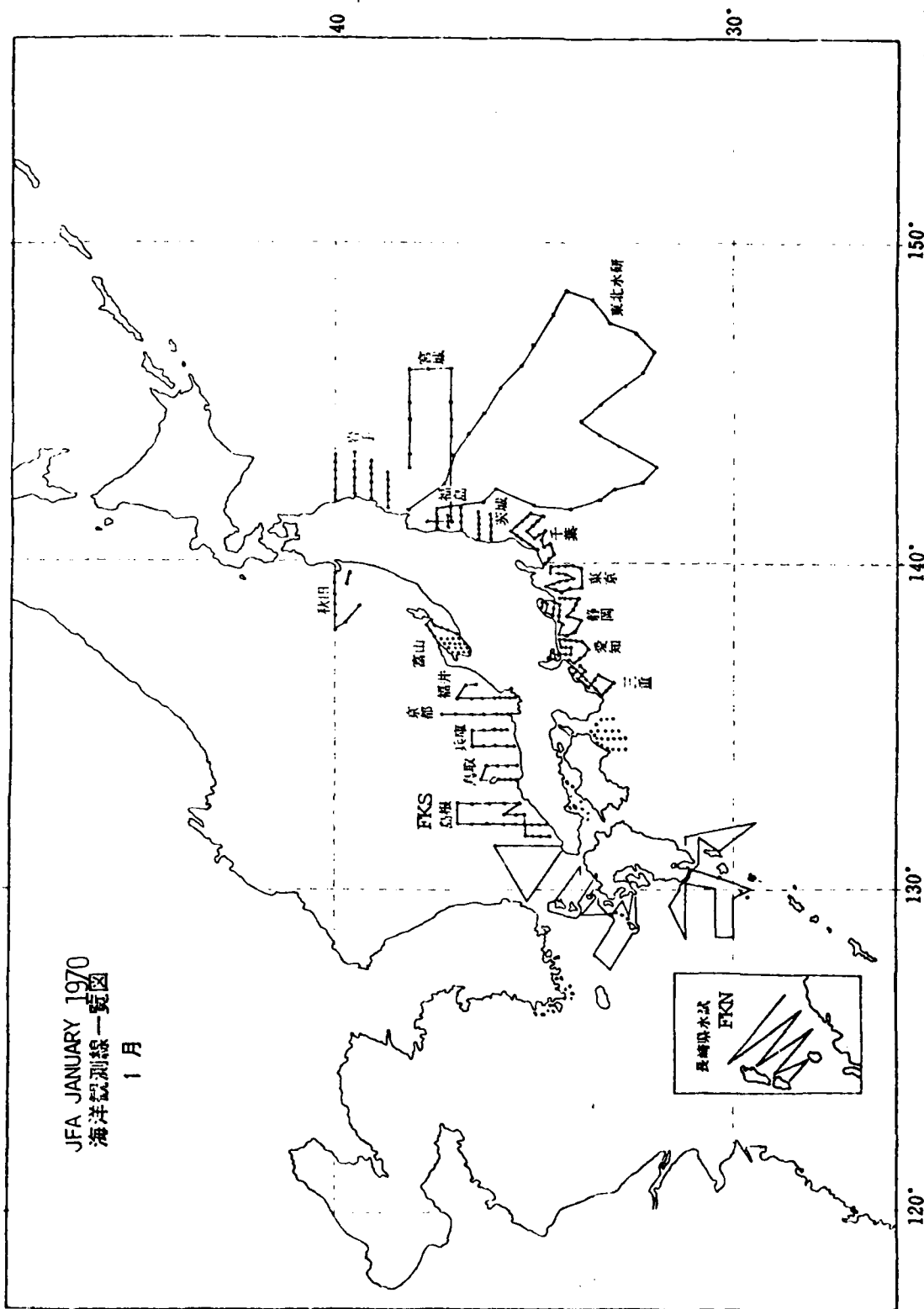




JFA DECEMBER 1969
 海洋観測線一覽図
 12 月

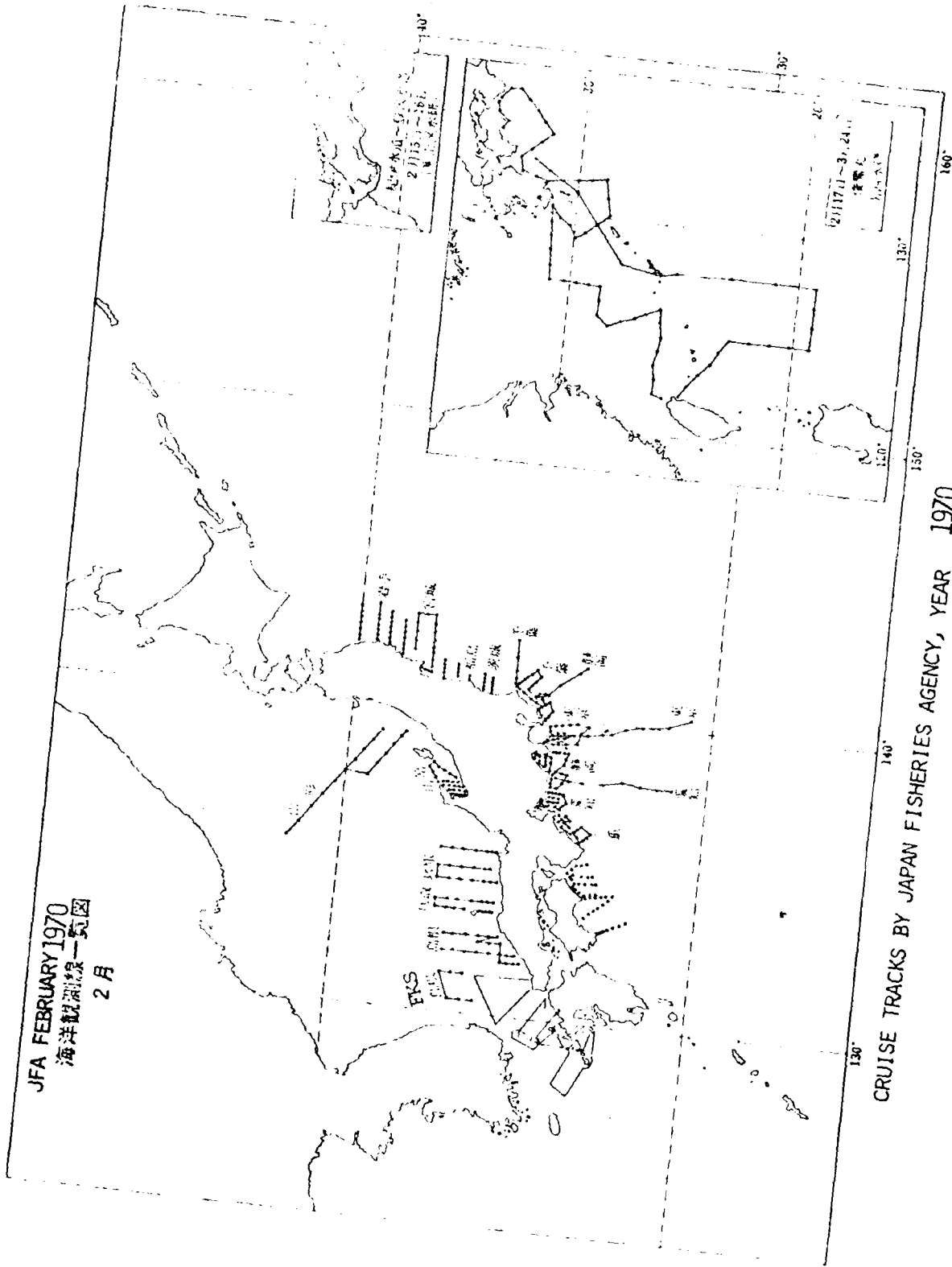
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1969

JFA JANUARY 1970
海洋観測線一覽図
1月

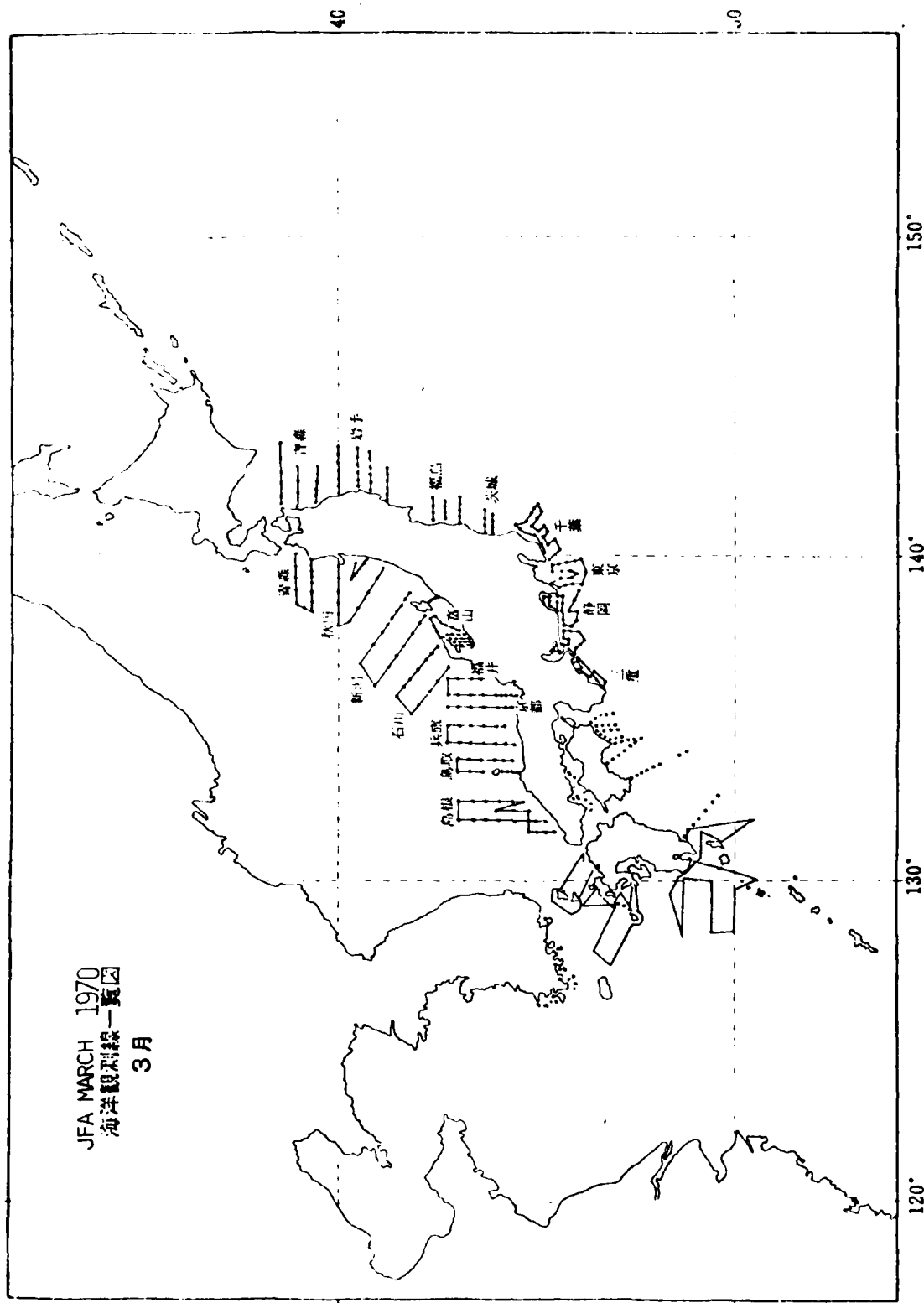


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970

JFA FEBRUARY 1970
 海洋観測線一覽図
 2月

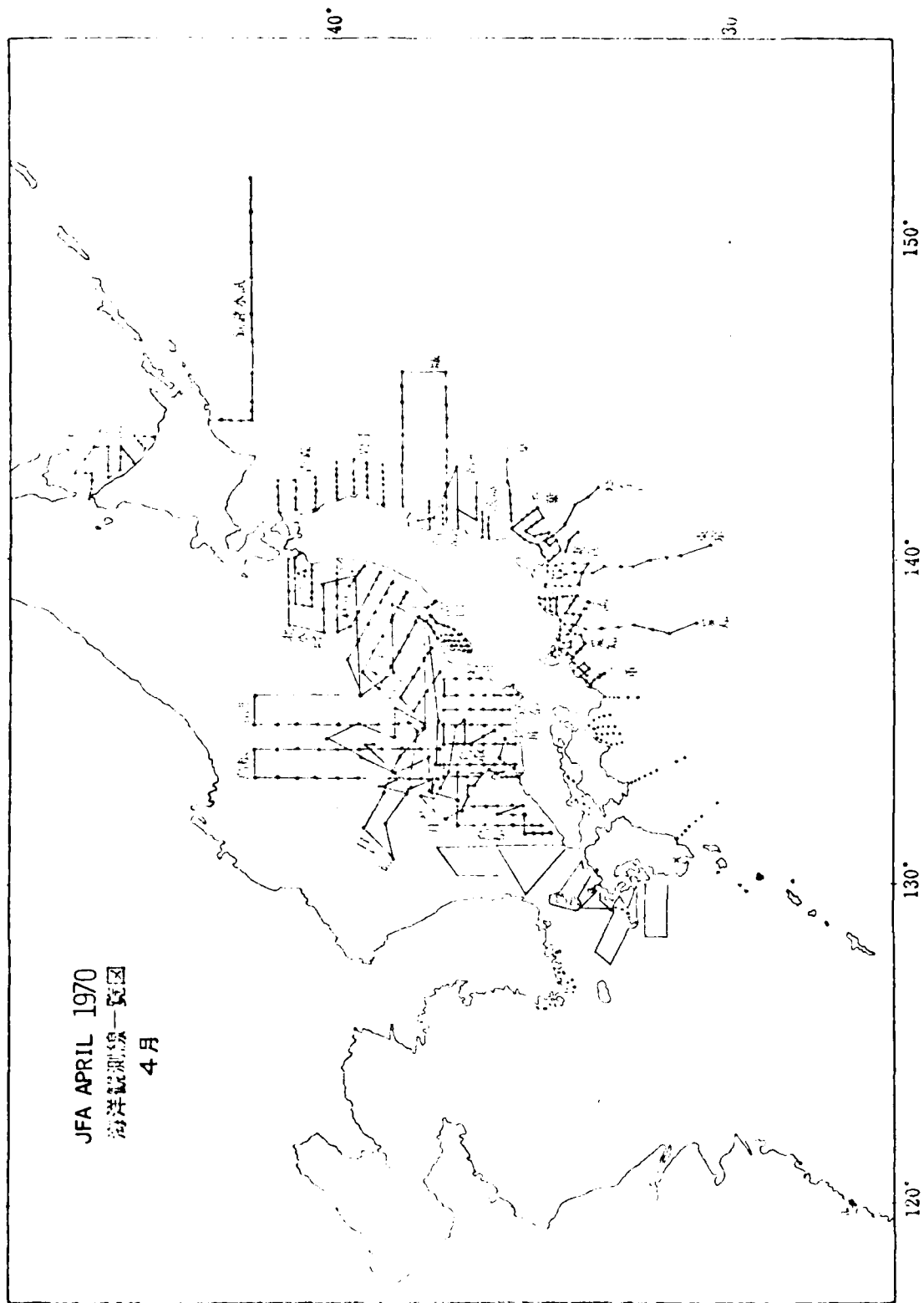


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970



JFA MARCH 1970
海洋観測線一覽図
3月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970



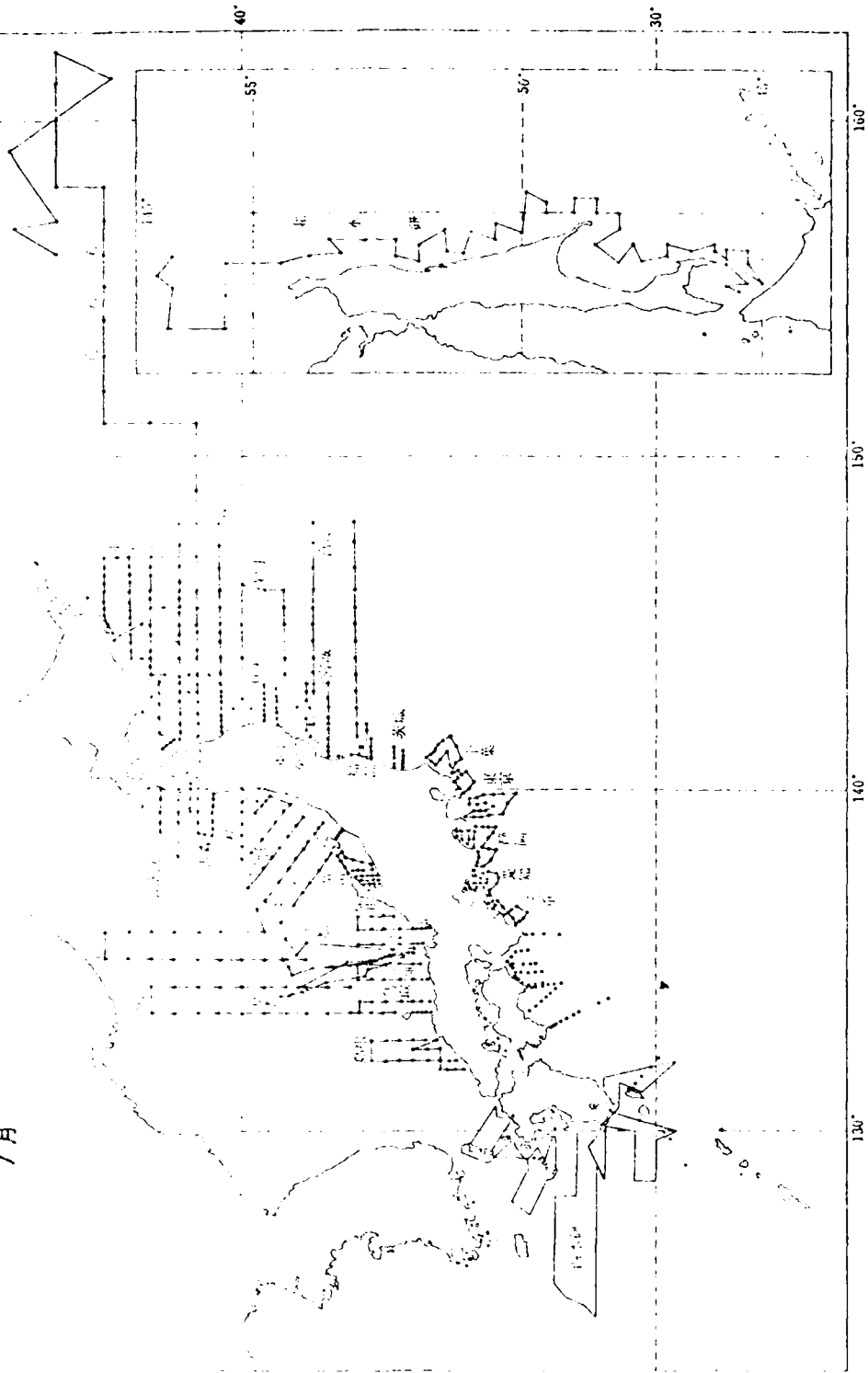
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CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970

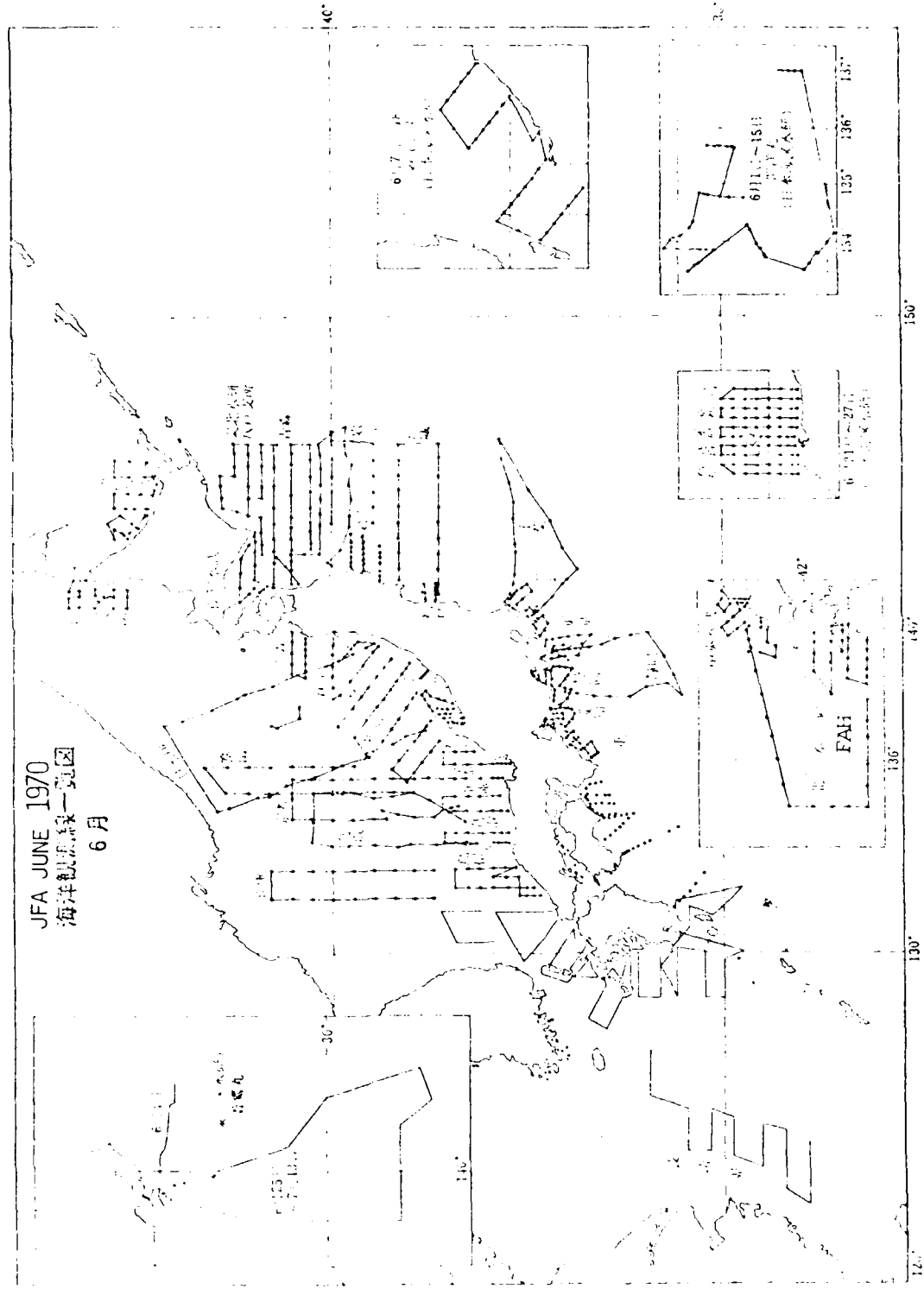
JFA JULY 1970
海産資源調査隊

7月



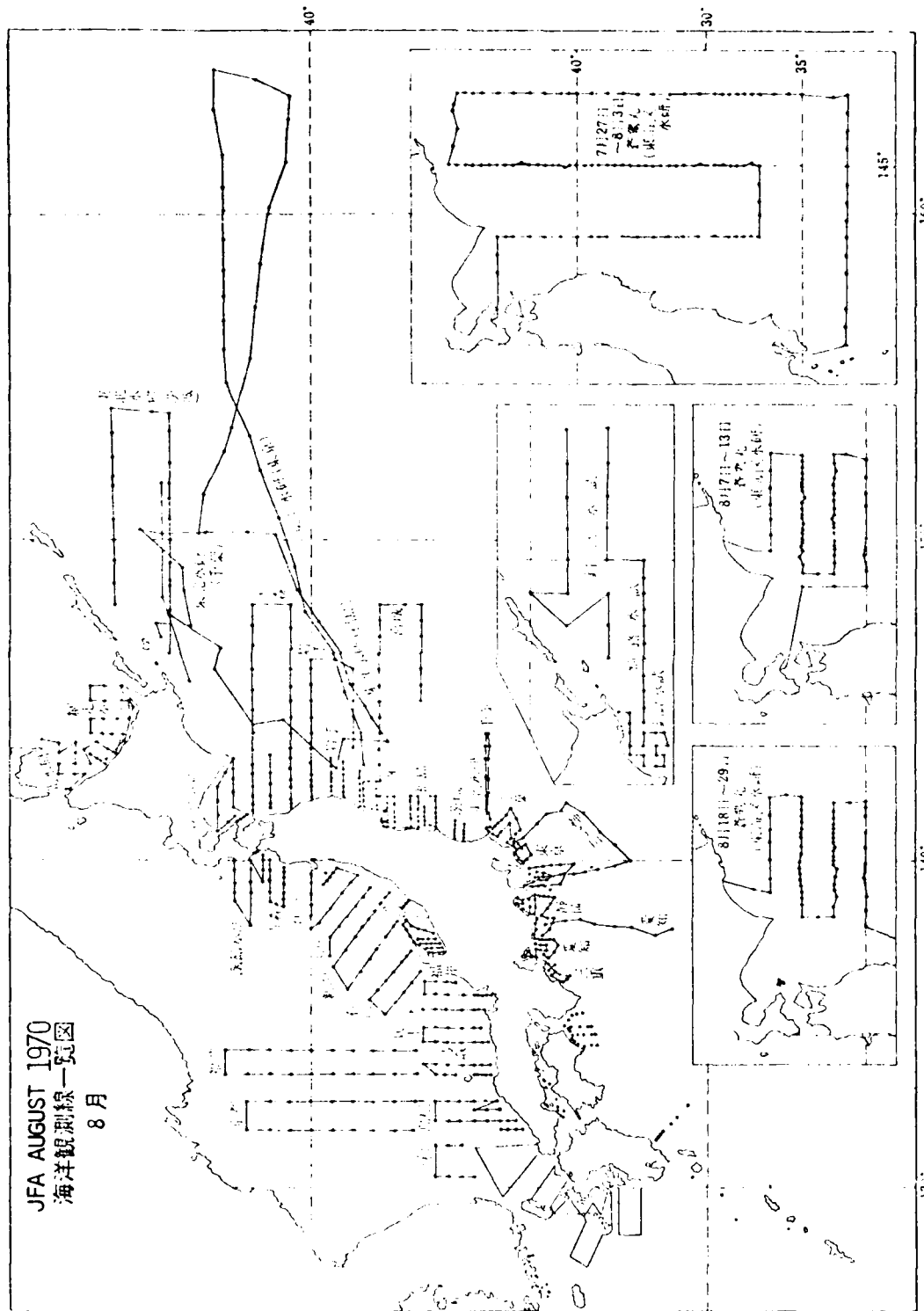
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970

JFA JUNE 1970
海洋観測線一覽図
6月



JFA AUGUST 1970
海洋観測線一覽図

8月

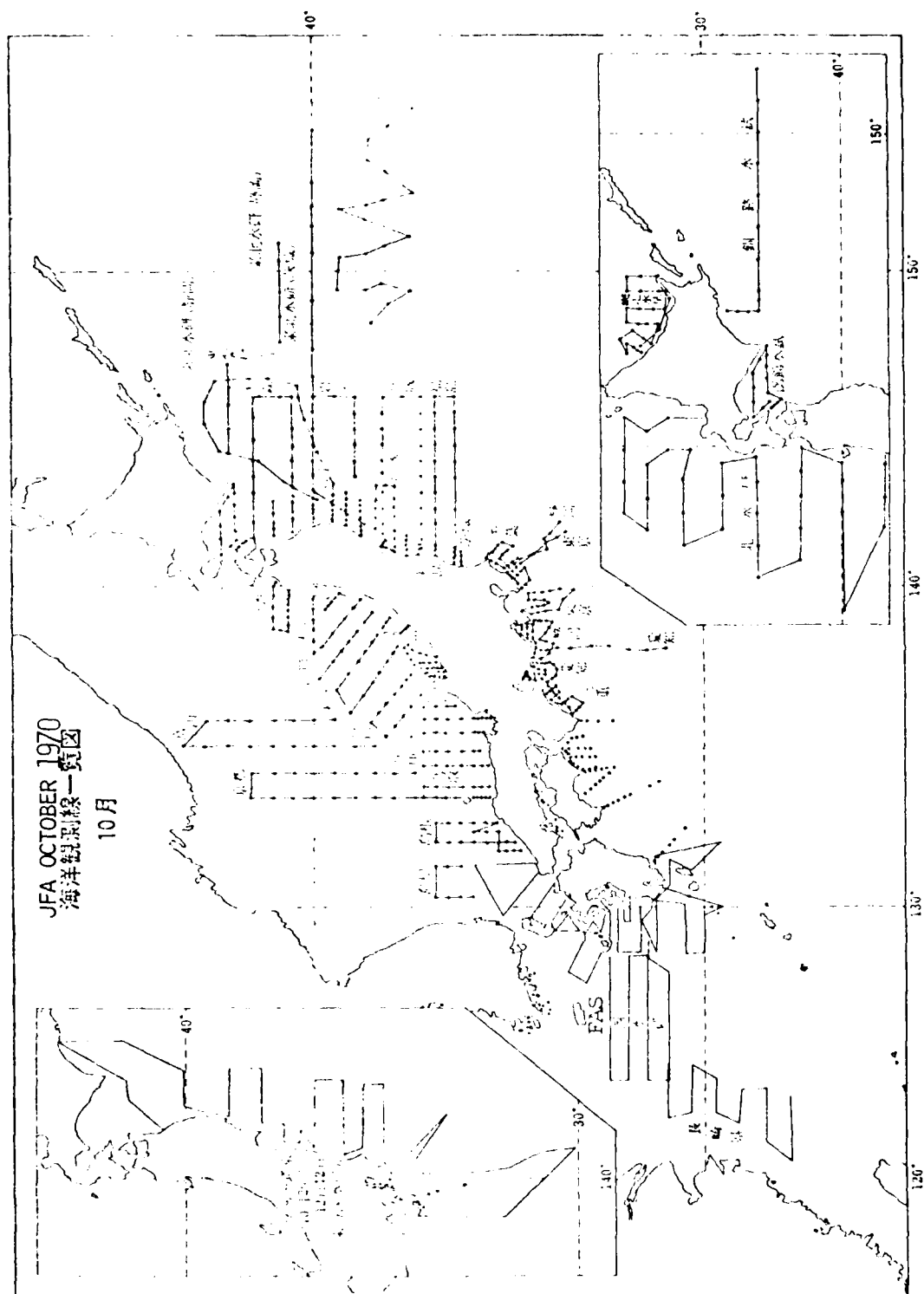


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970

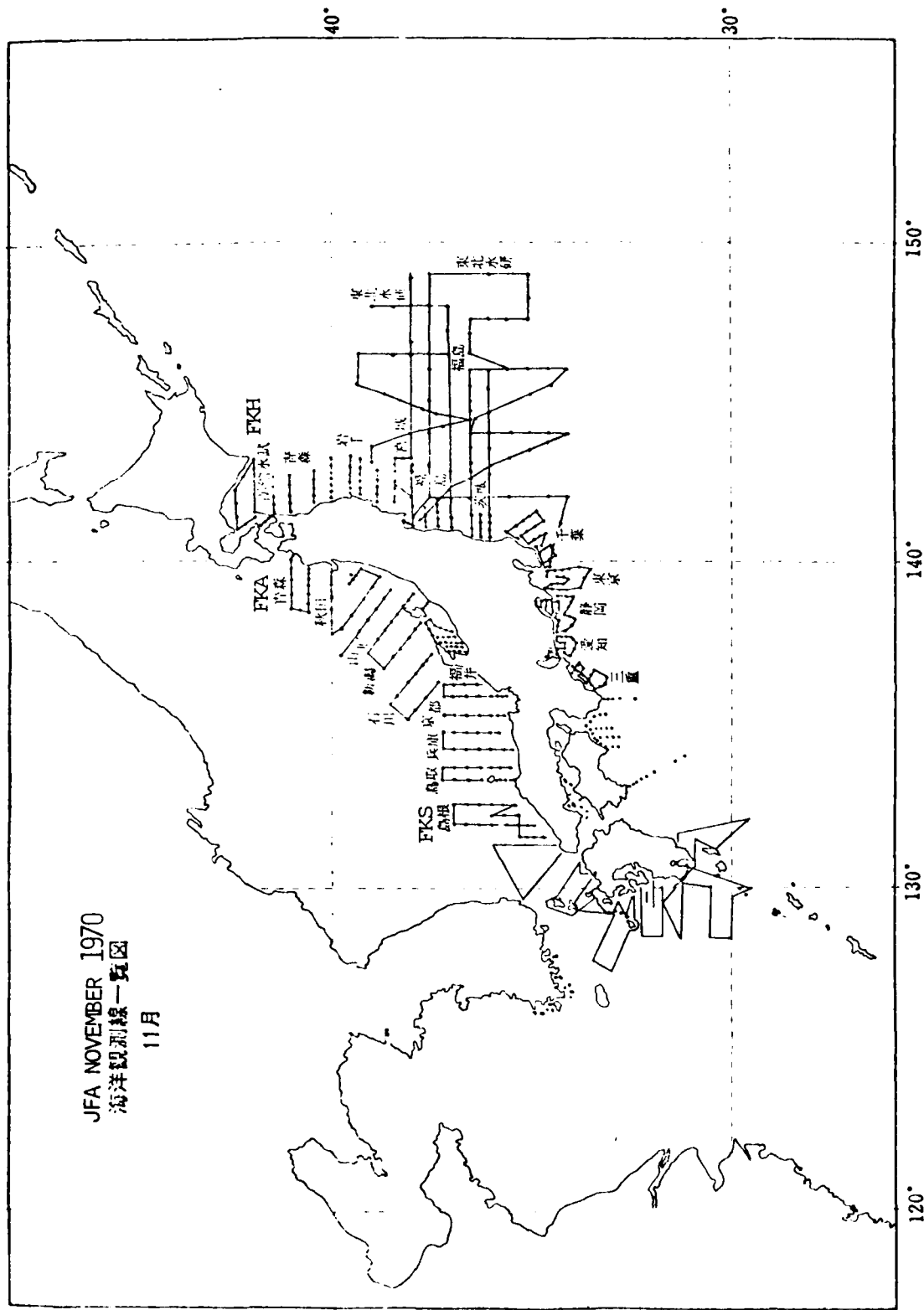
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CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970



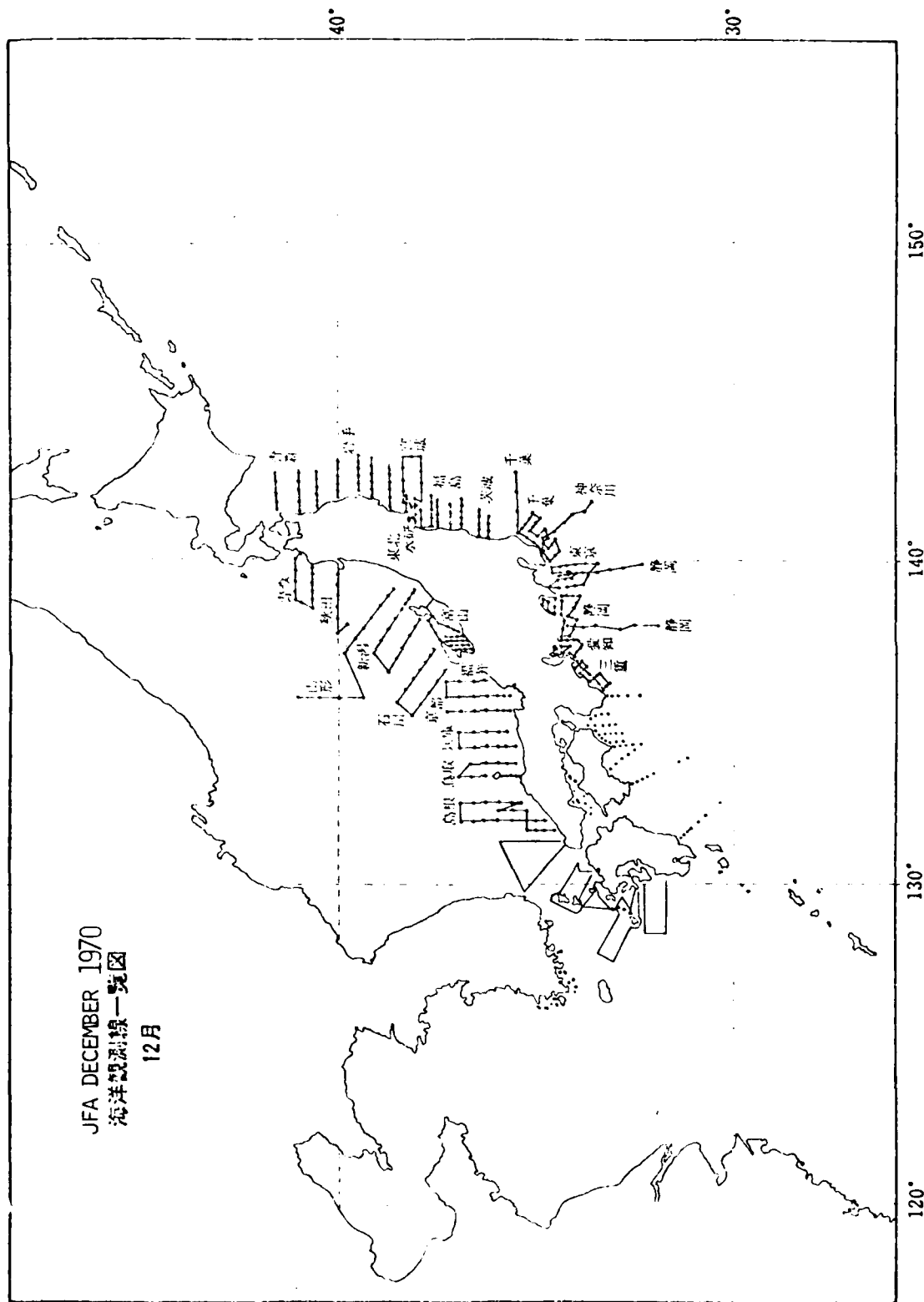
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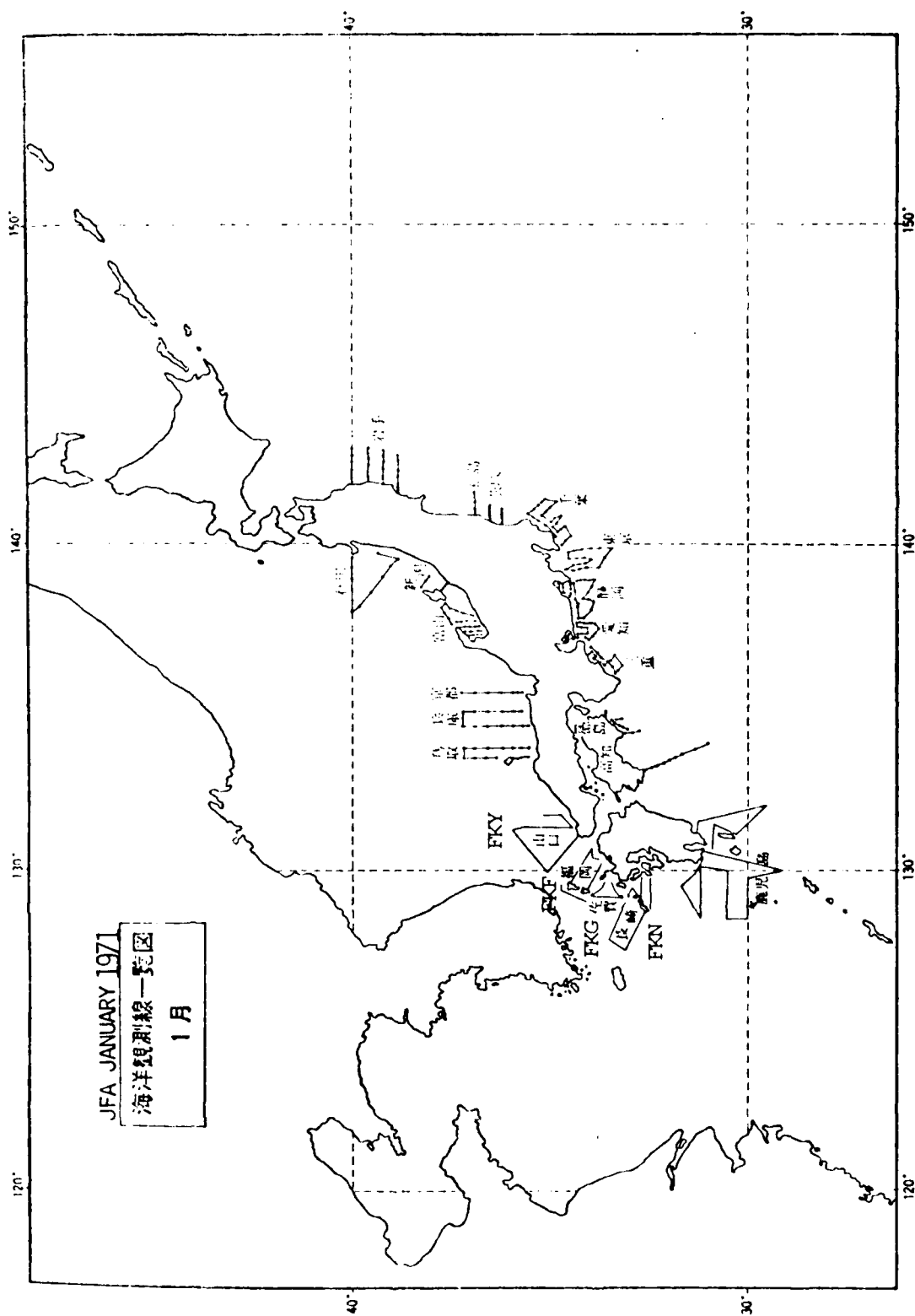
JFA NOVEMBER 1970
 海洋観測線一覧図
 11月

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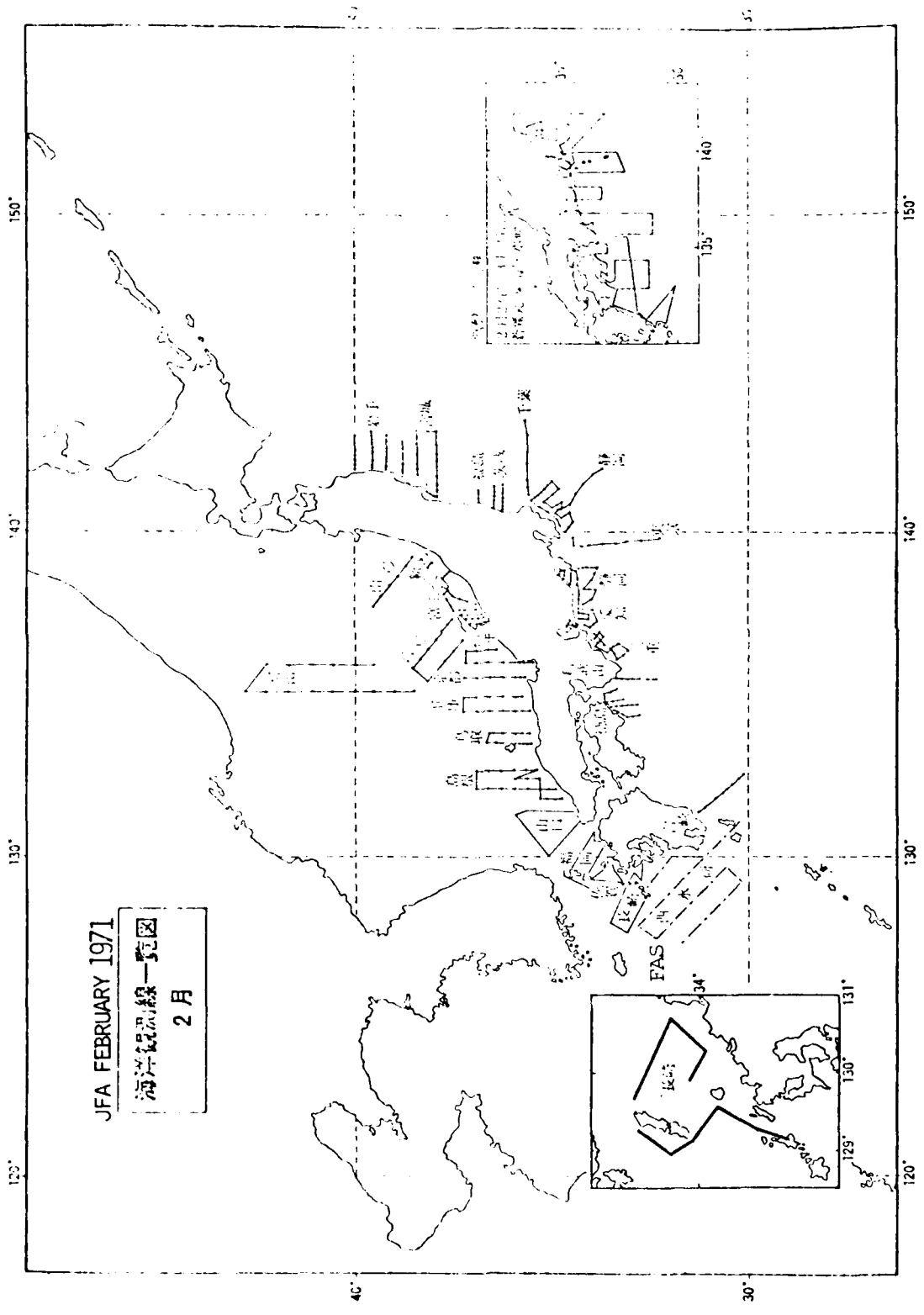
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 海洋観測線一覽図
 12月



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1970



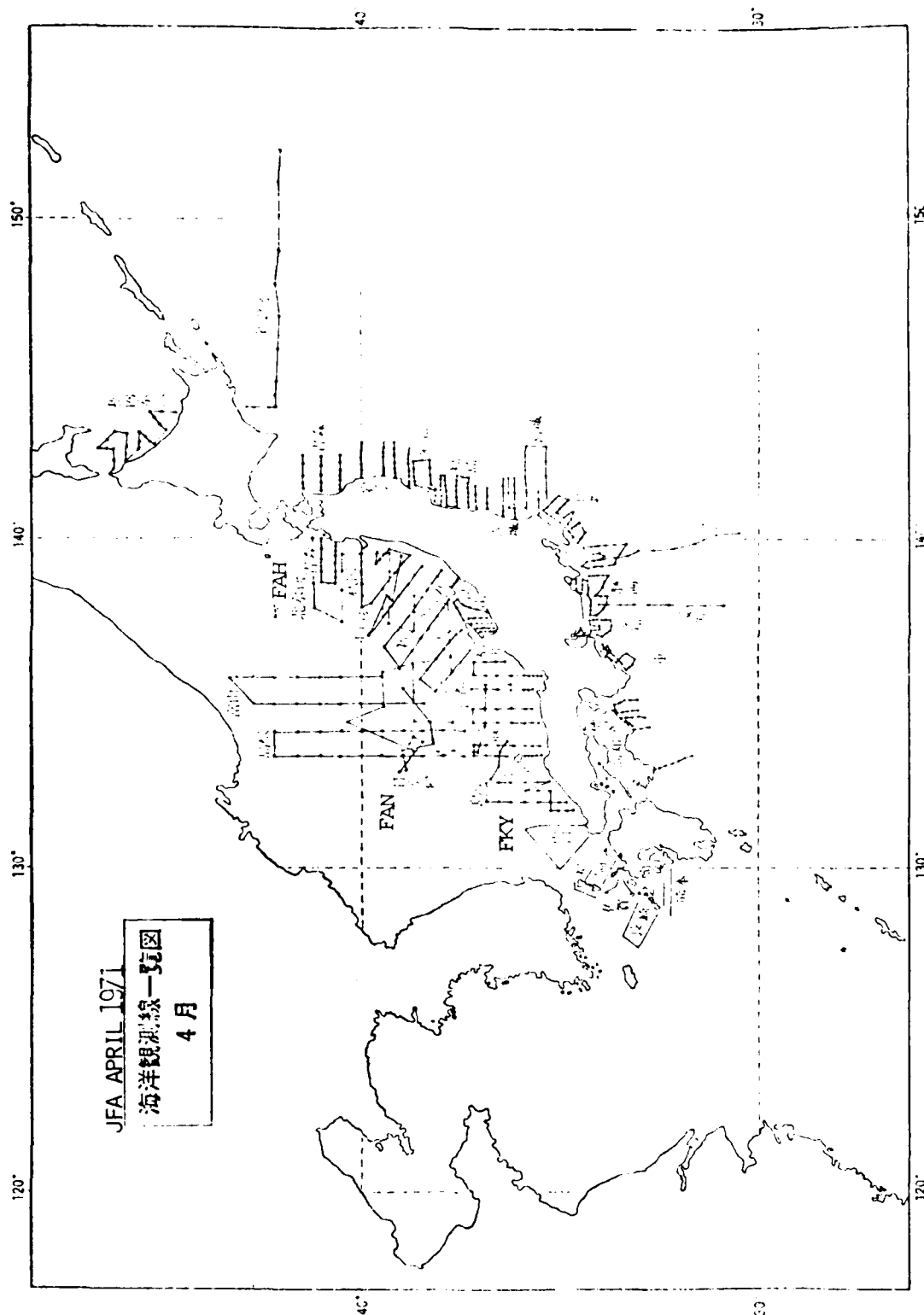
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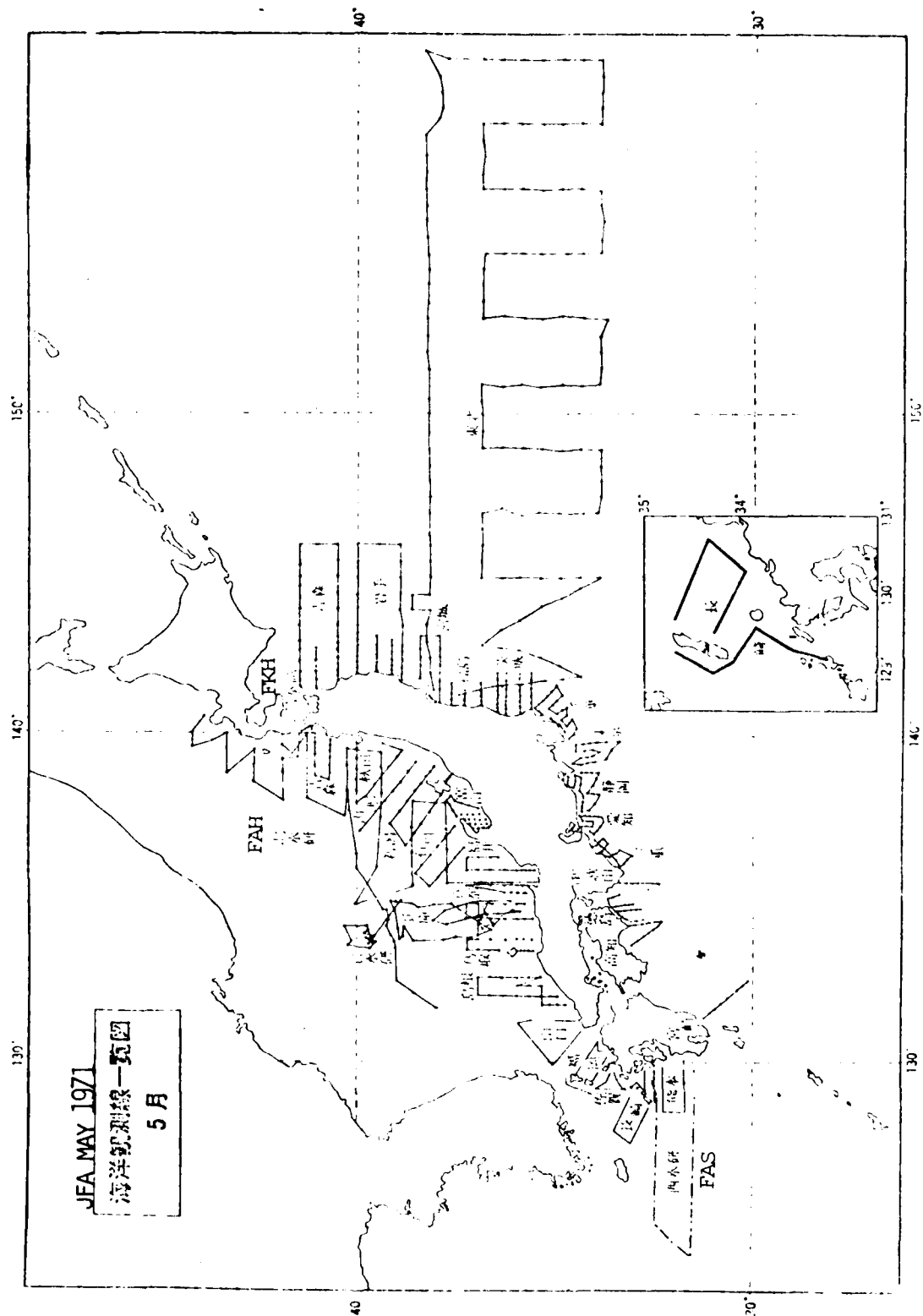
JFA FEBRUARY 1971

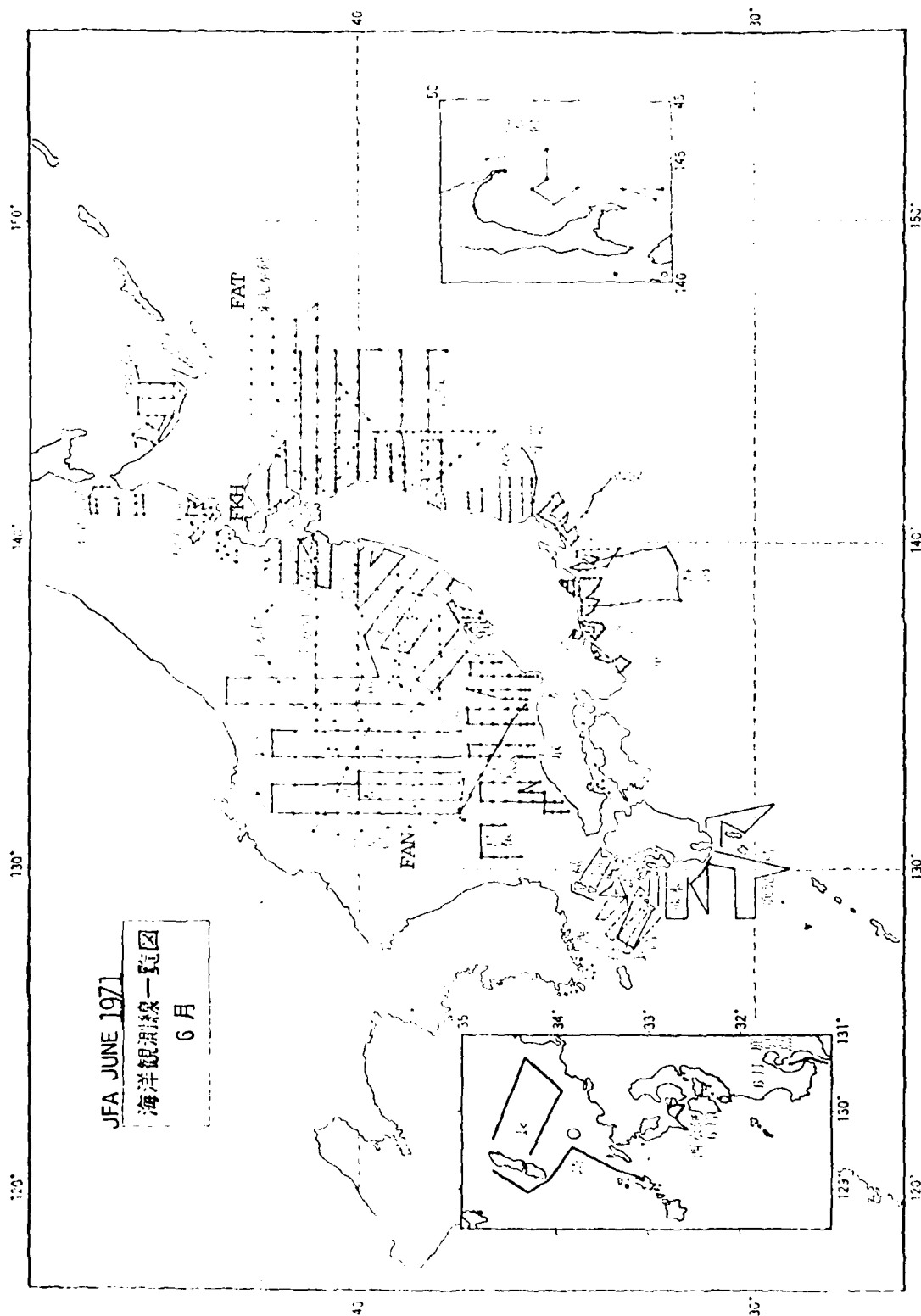
海洋観測線一覽図
2月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1971



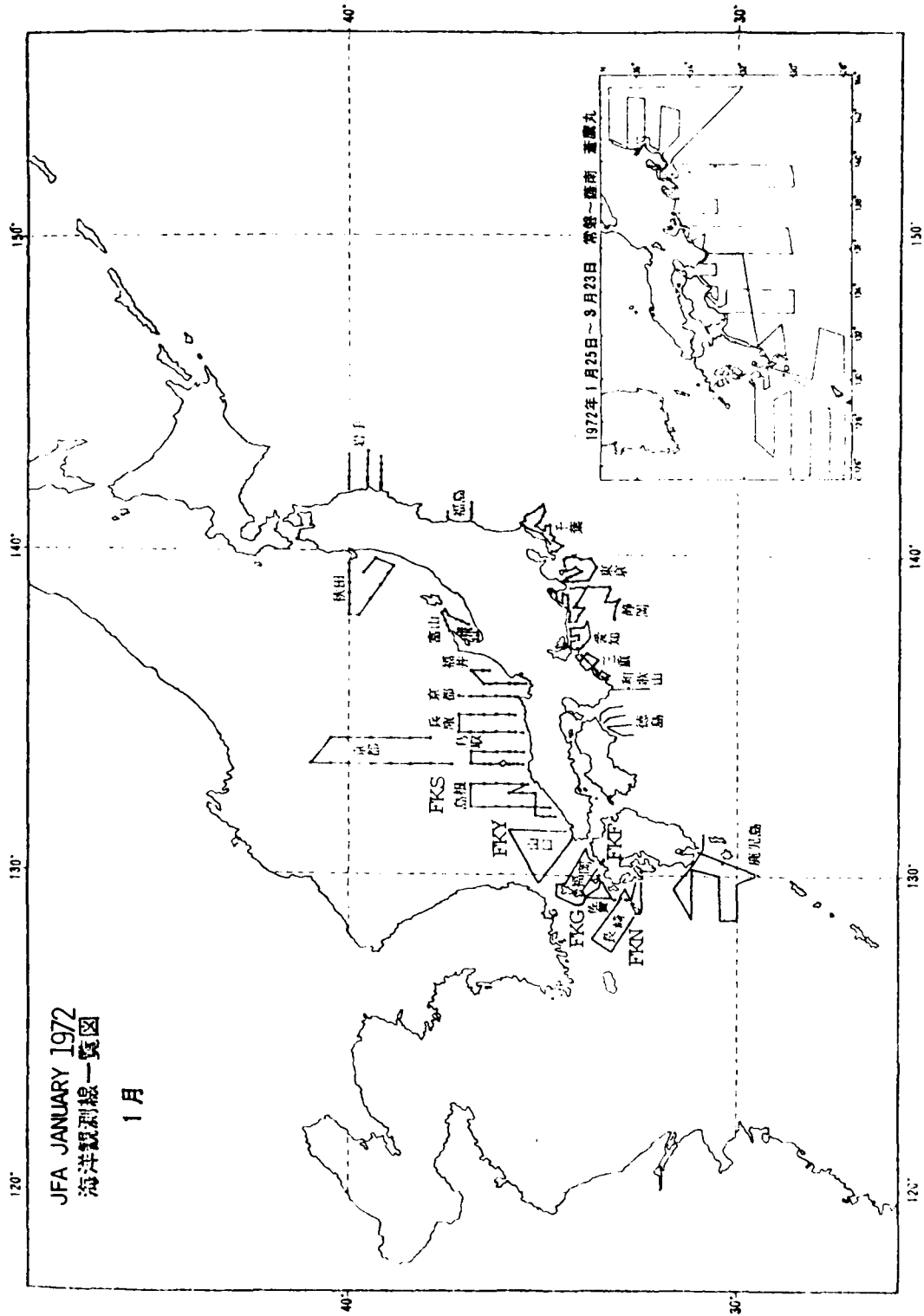
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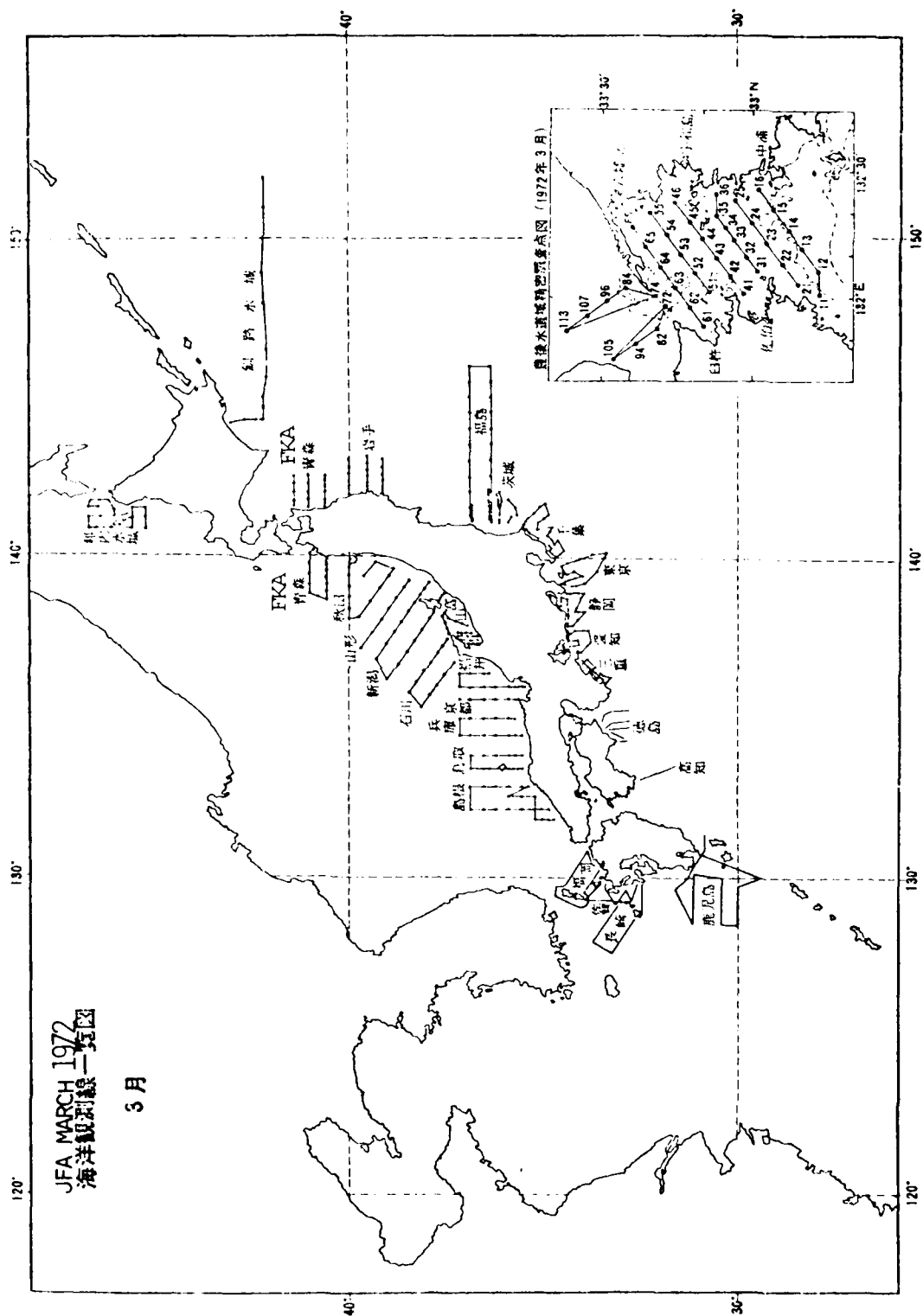




JFA JUNE 1971
 海洋観測線一覽図
 6月

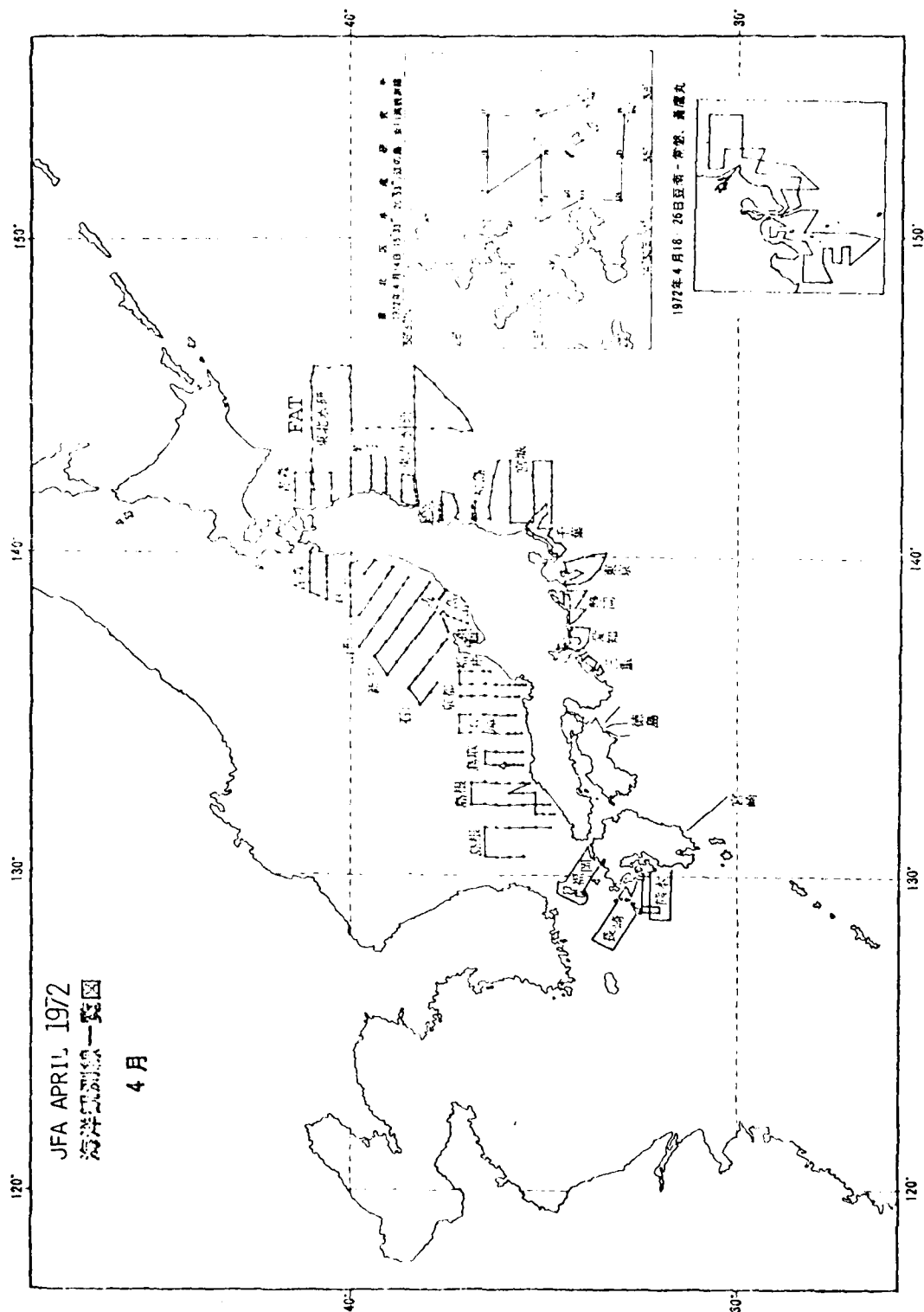
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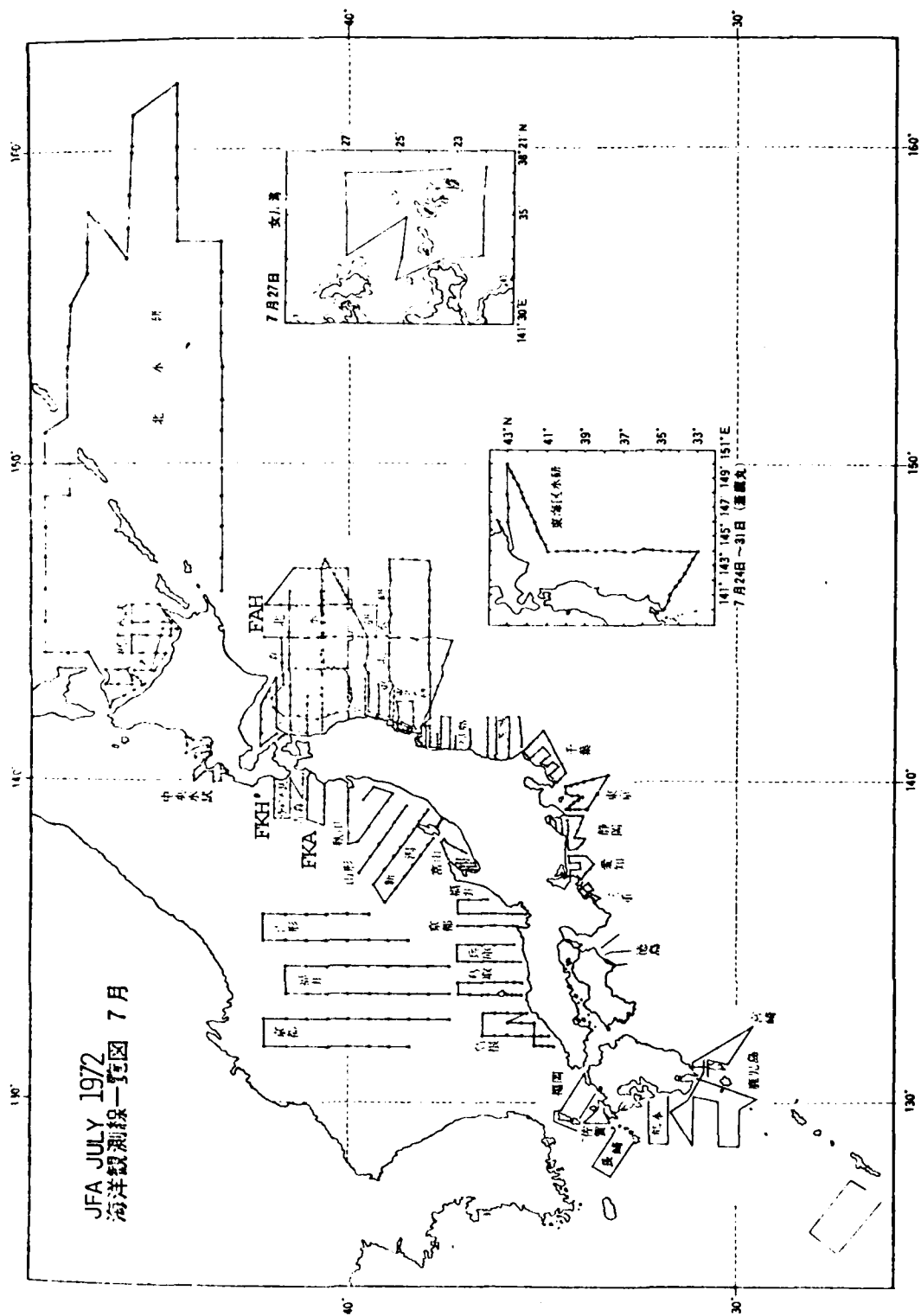


JFA MARCH 1972
海洋観測線一覽図

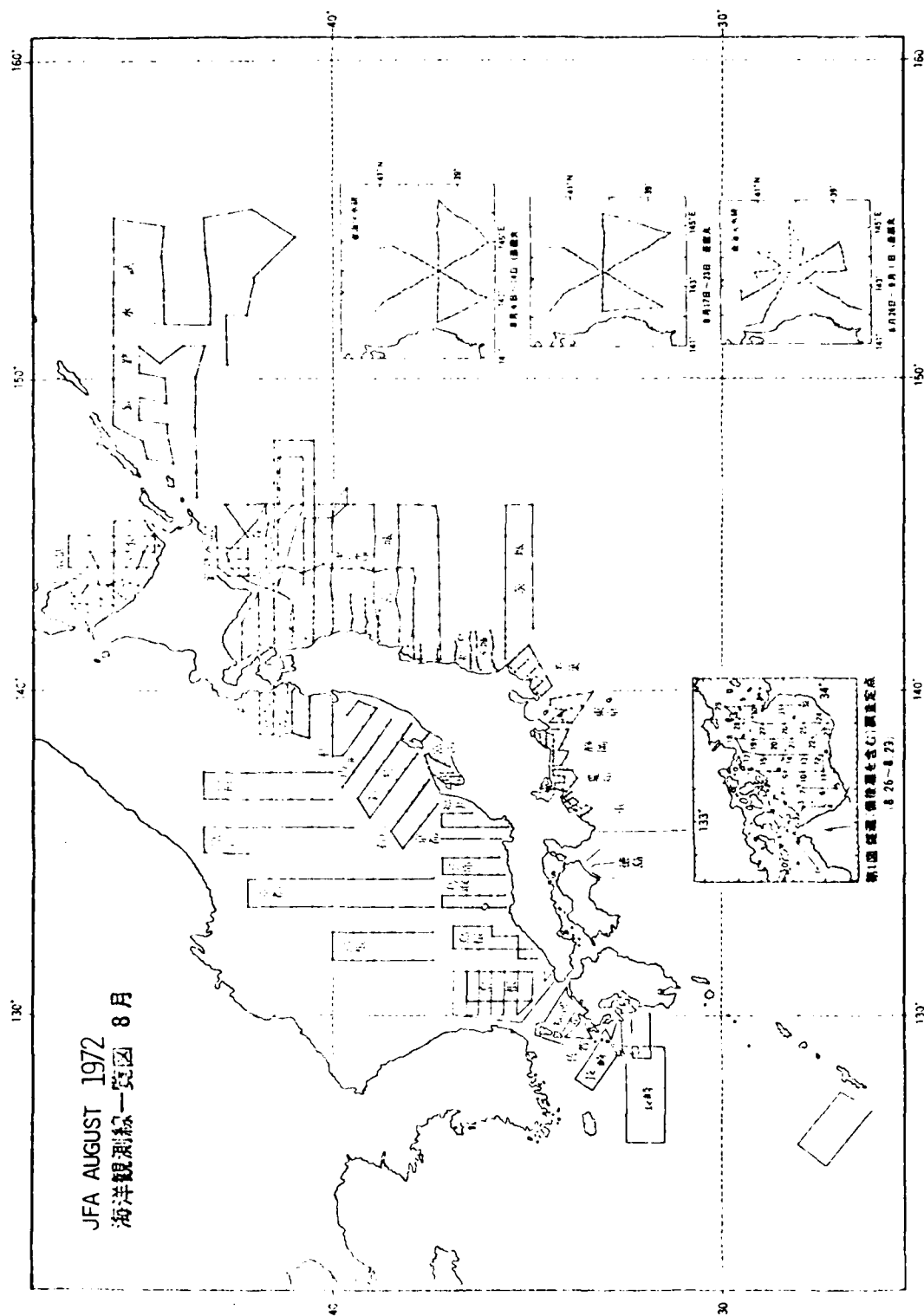
3月



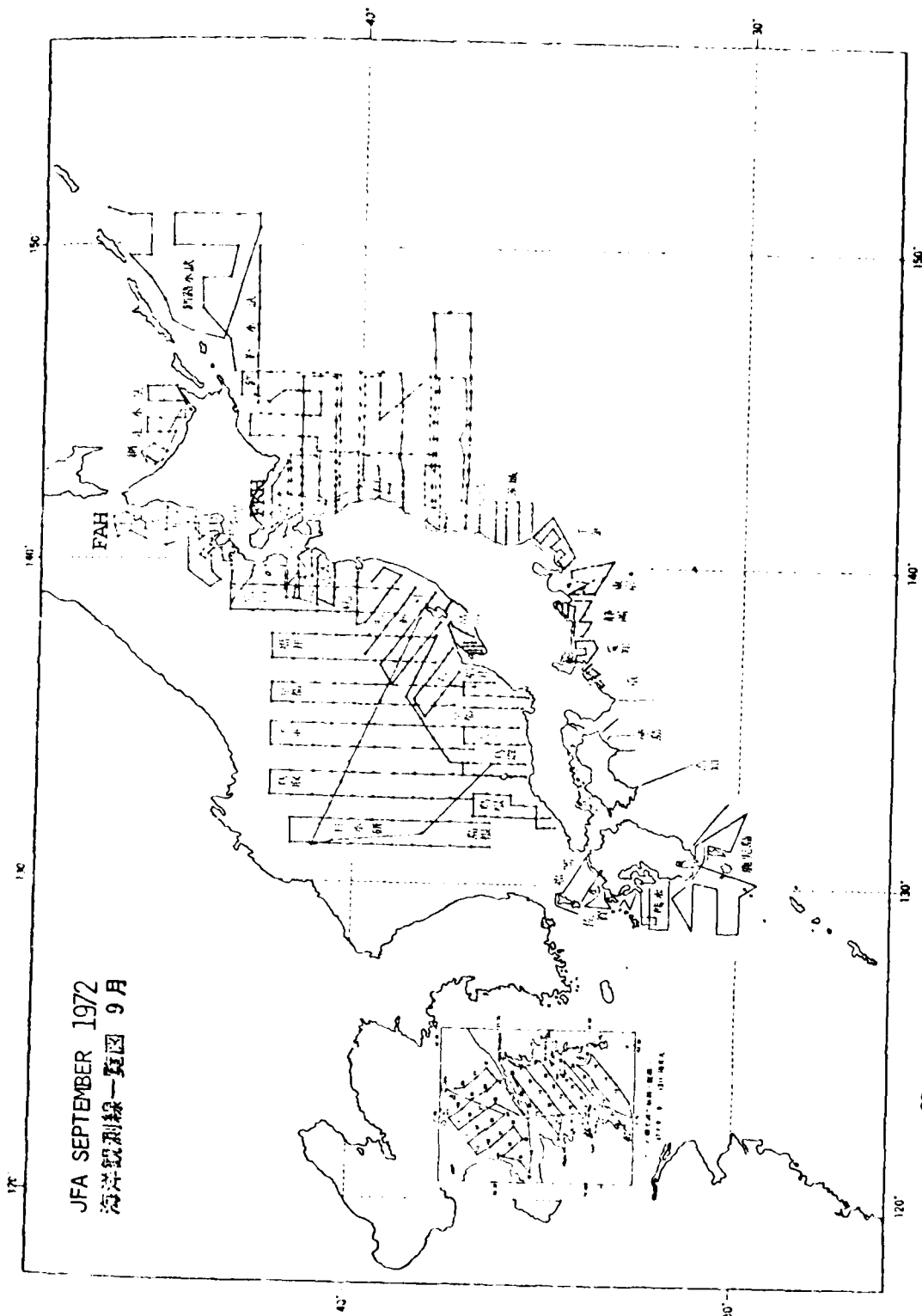
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1972



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1972

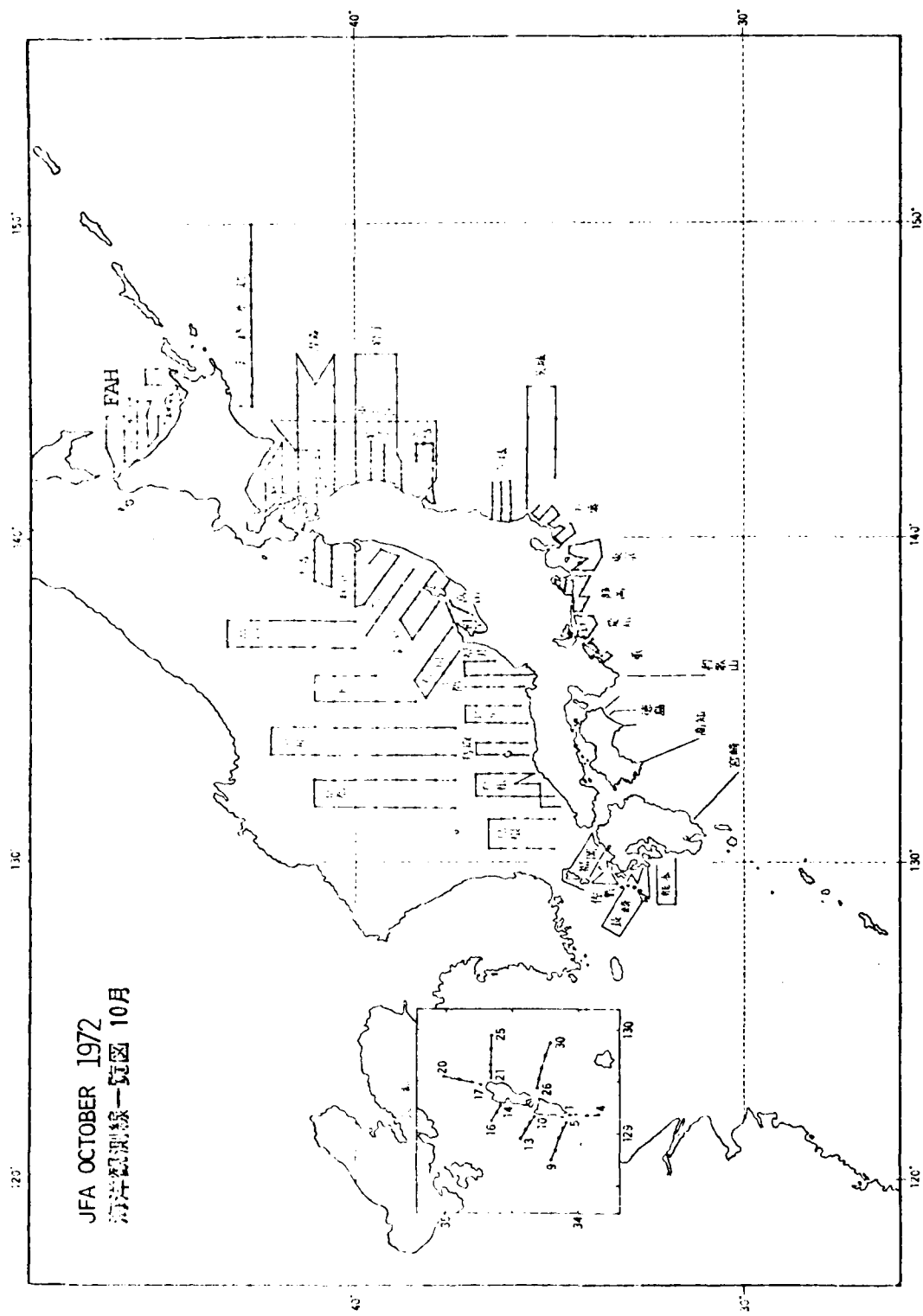


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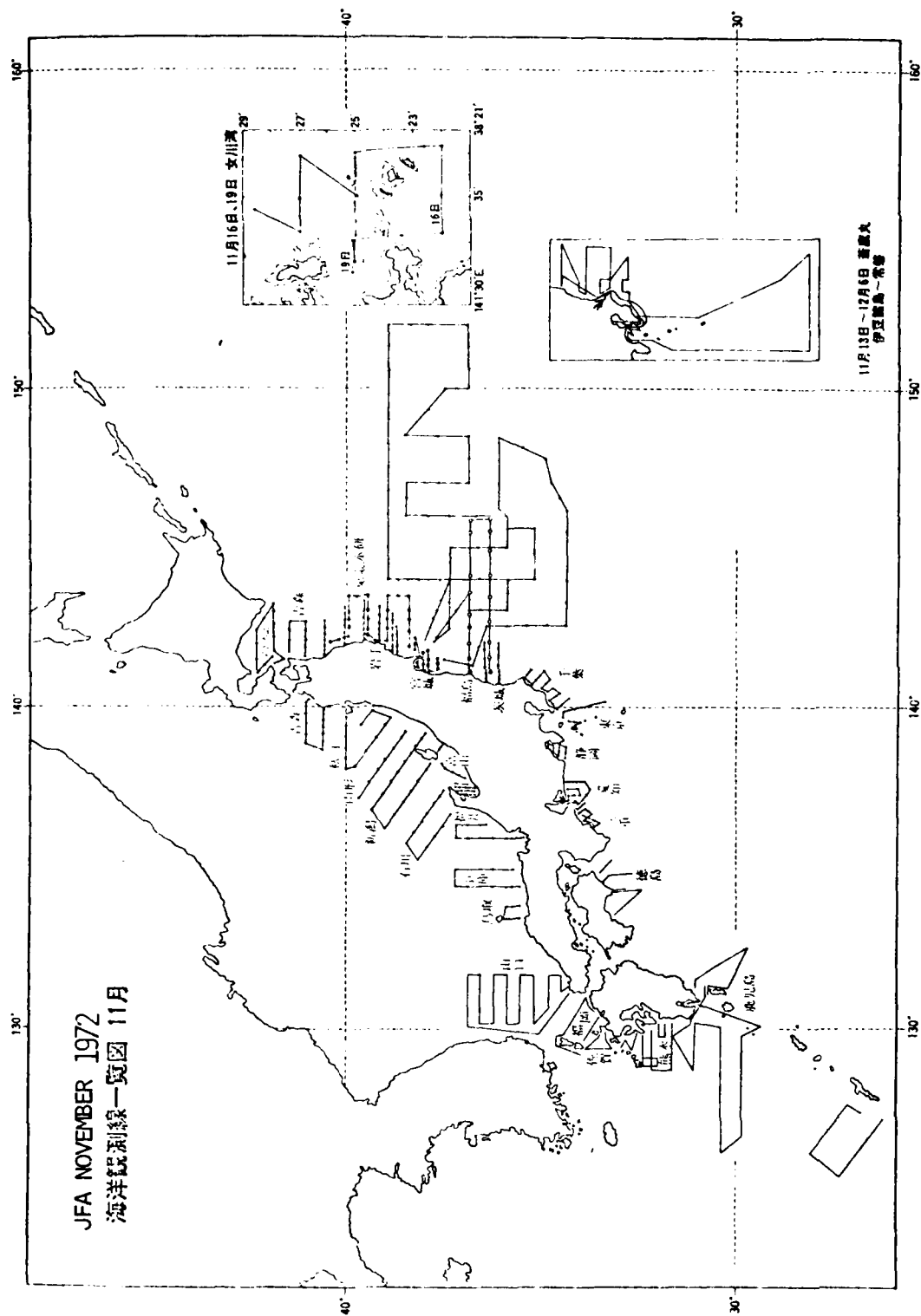
JFA SEPTEMBER 1972
海洋観測線一覽図 9月

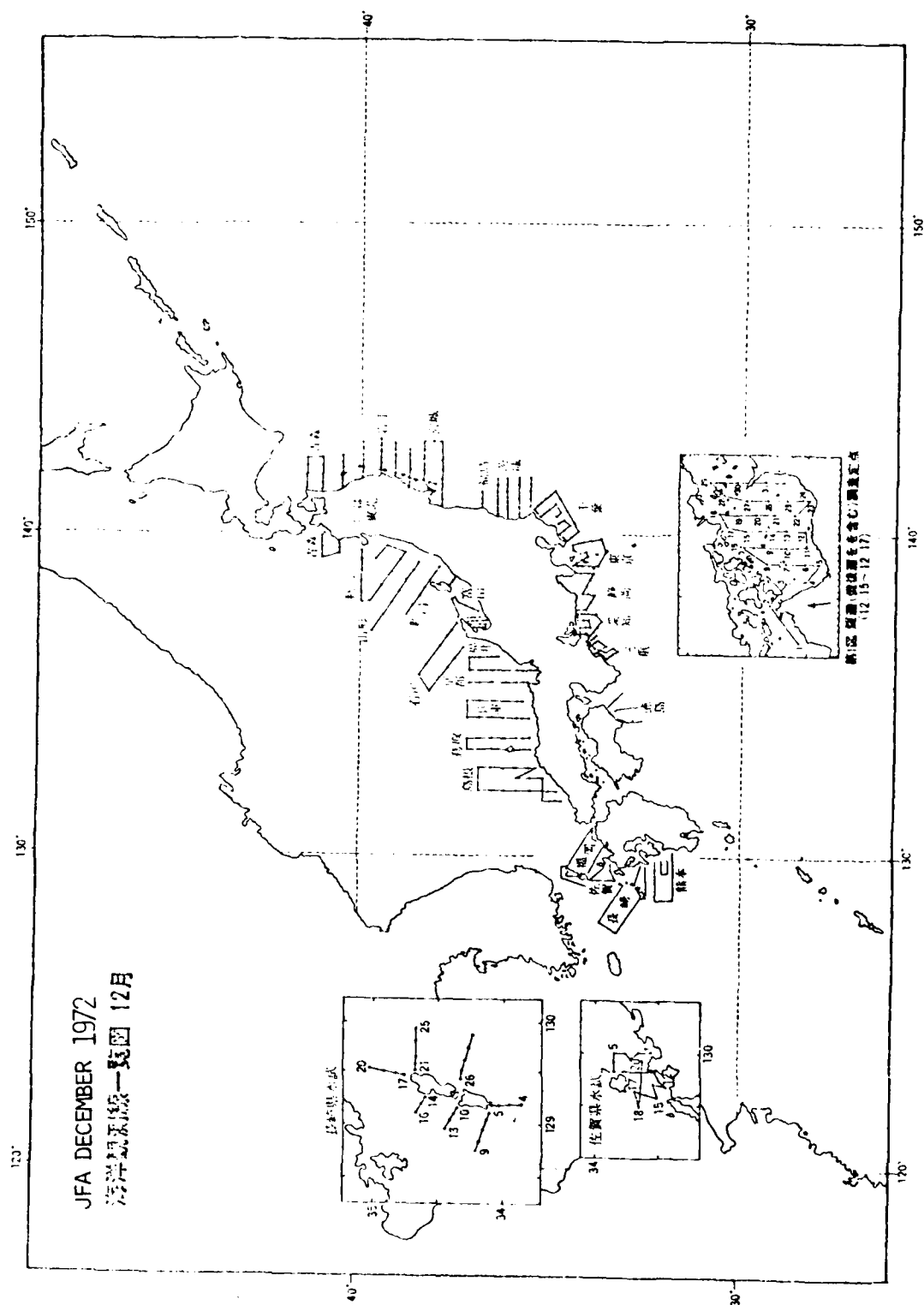
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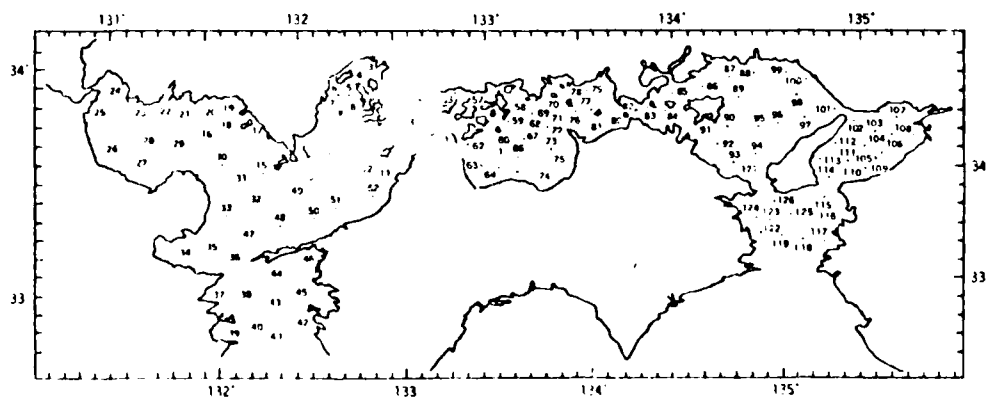
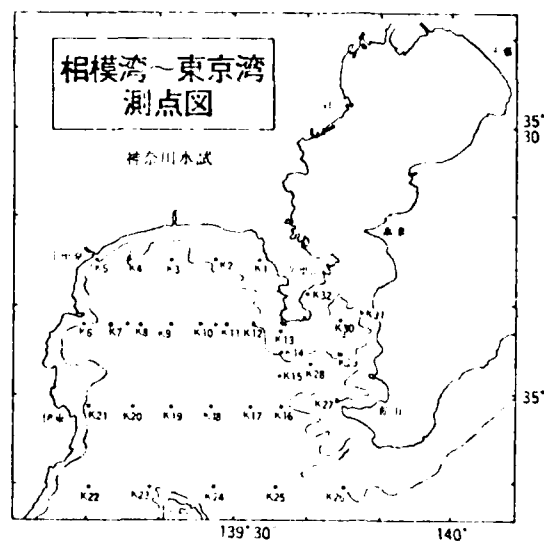
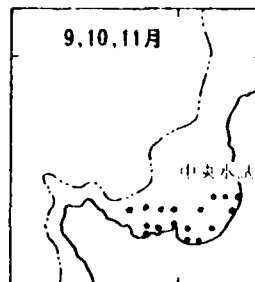
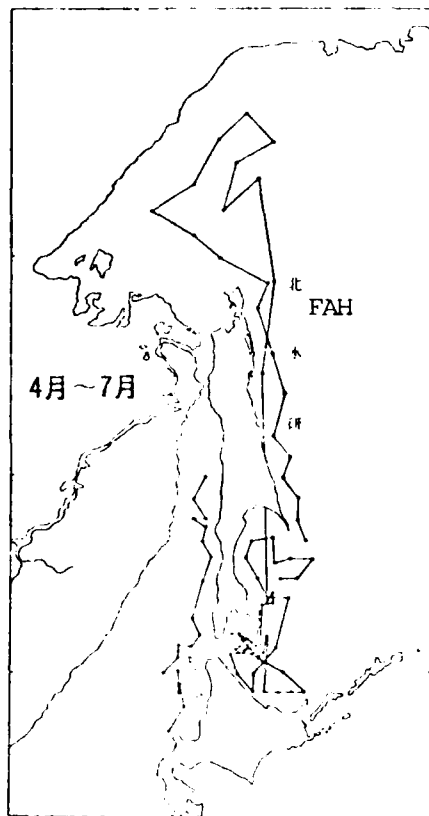
JFA OCTOBER 1972
 海洋観測線一覽圖 10月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1972





JFA 1972

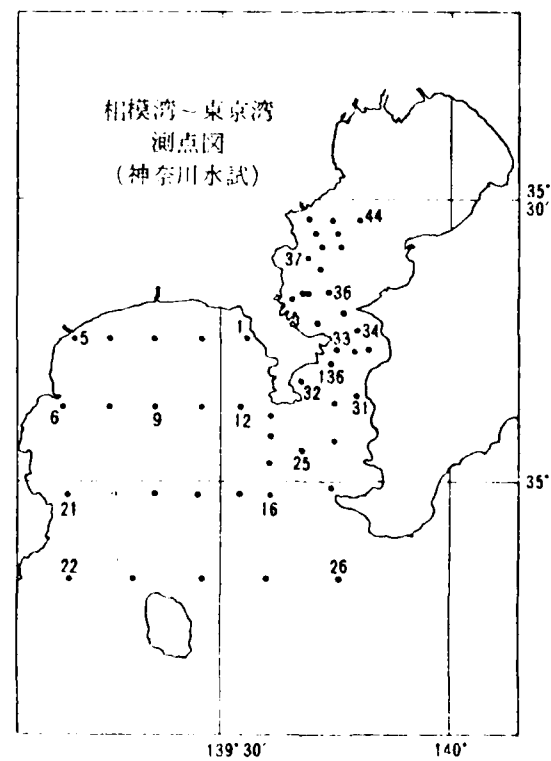
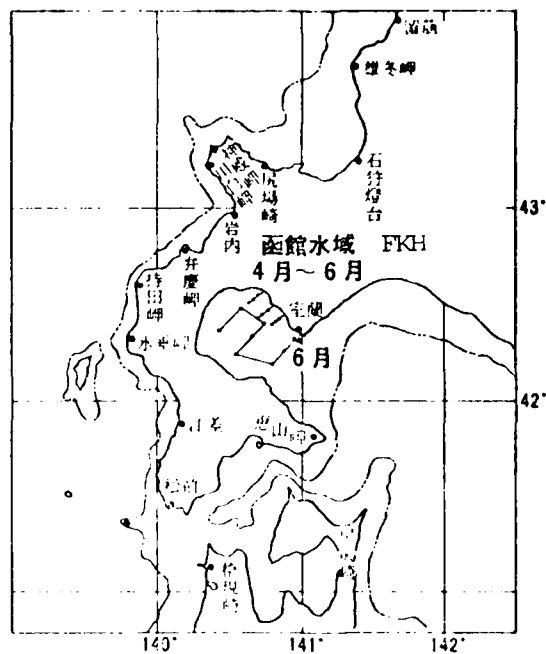
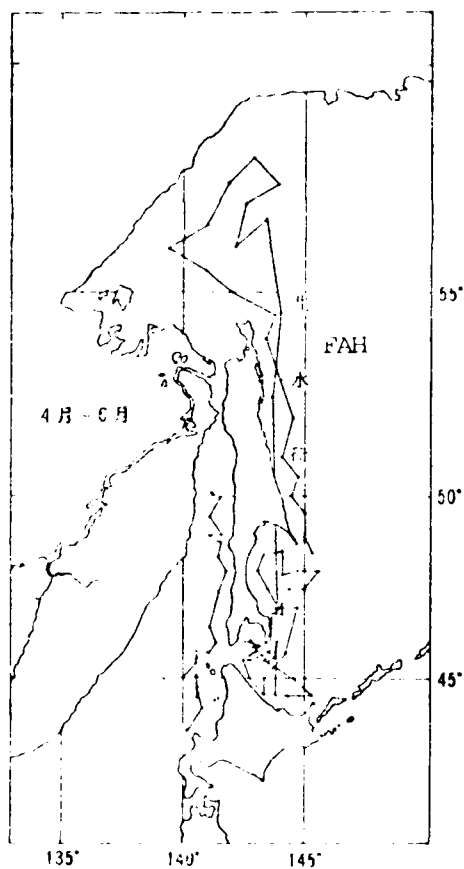


第2図 瀬戸内海全域調査定年

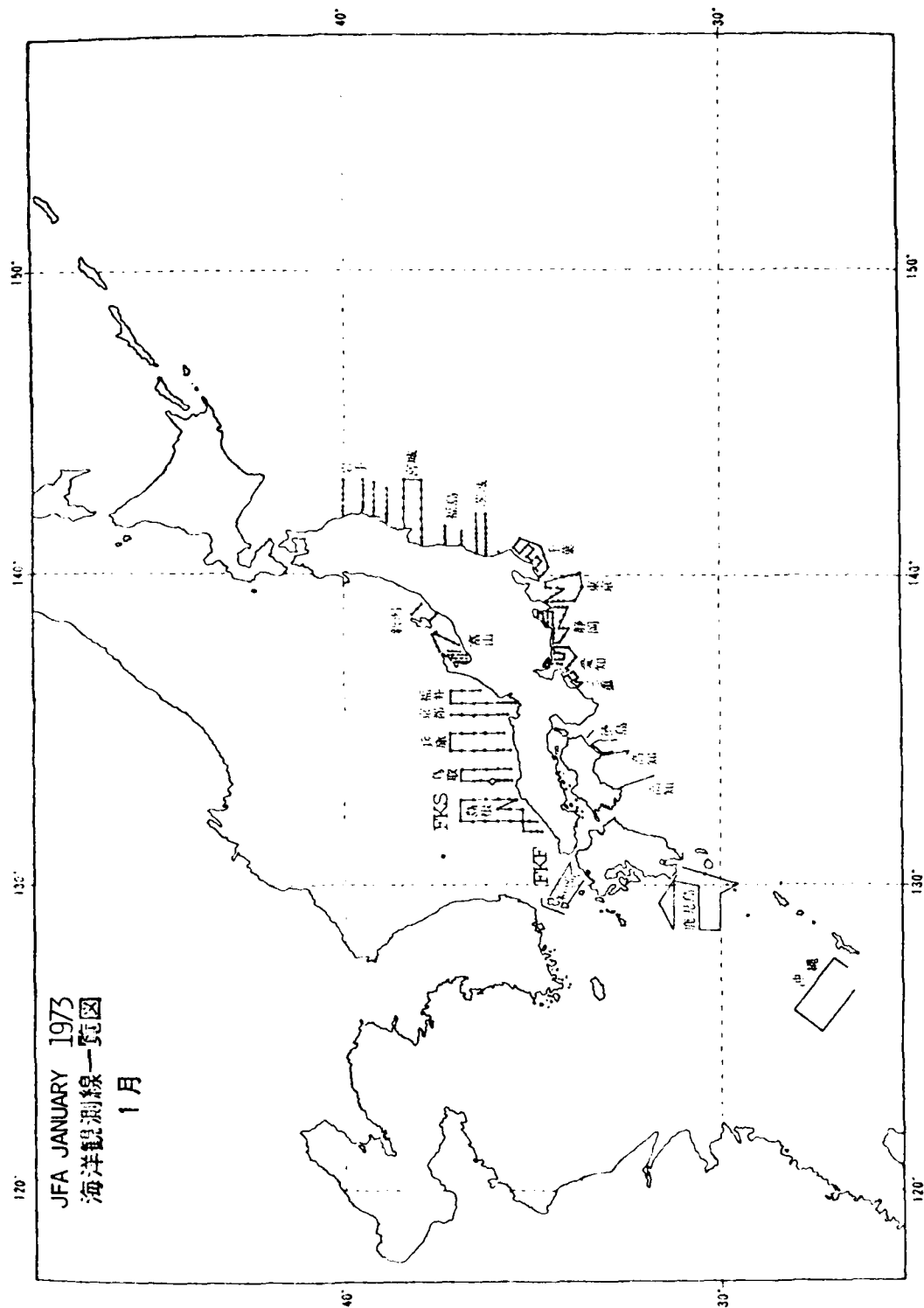
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CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1972

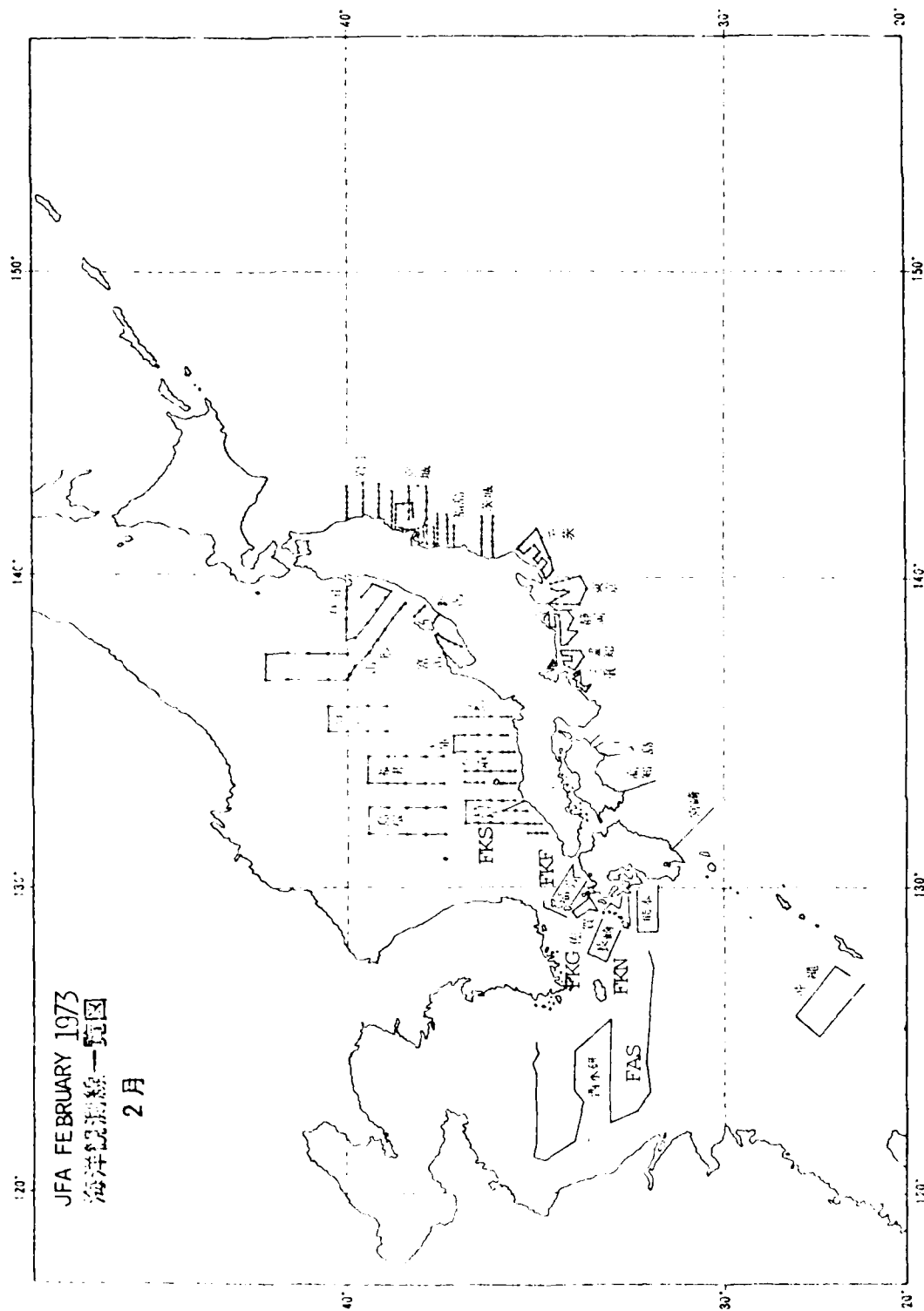
JFA 1972



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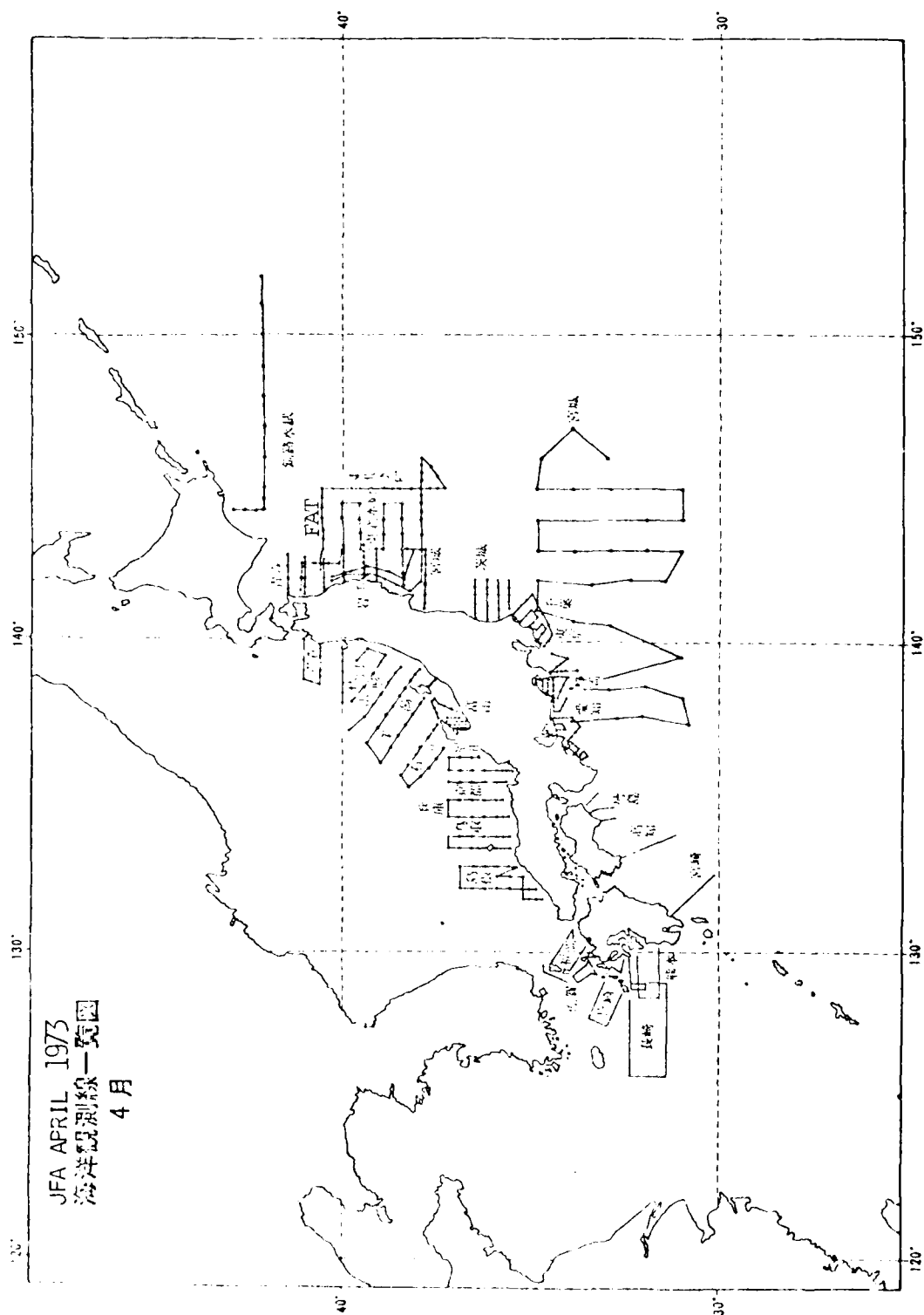


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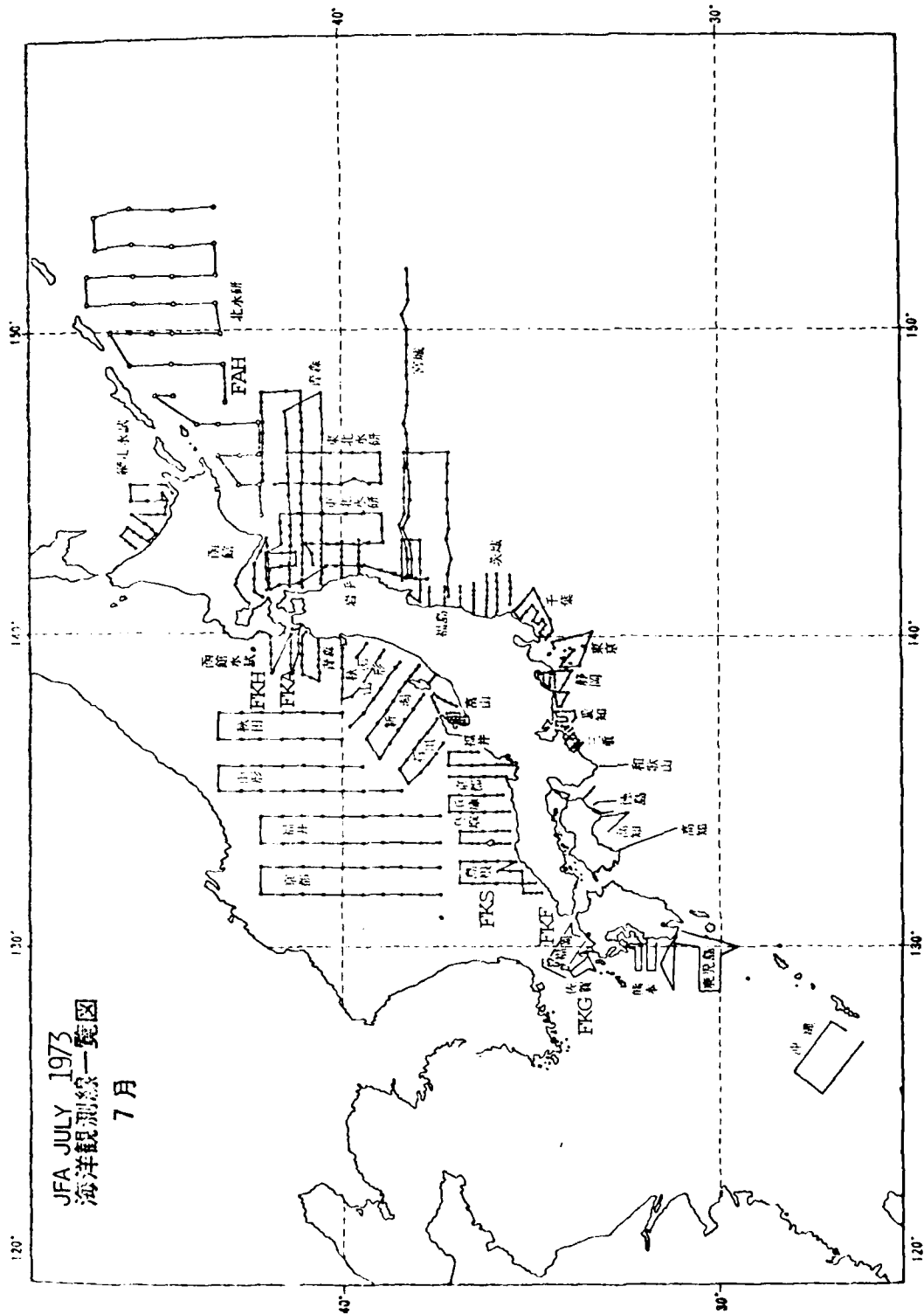
JFA FEBRUARY 1973
海洋観測線一覽図
2月

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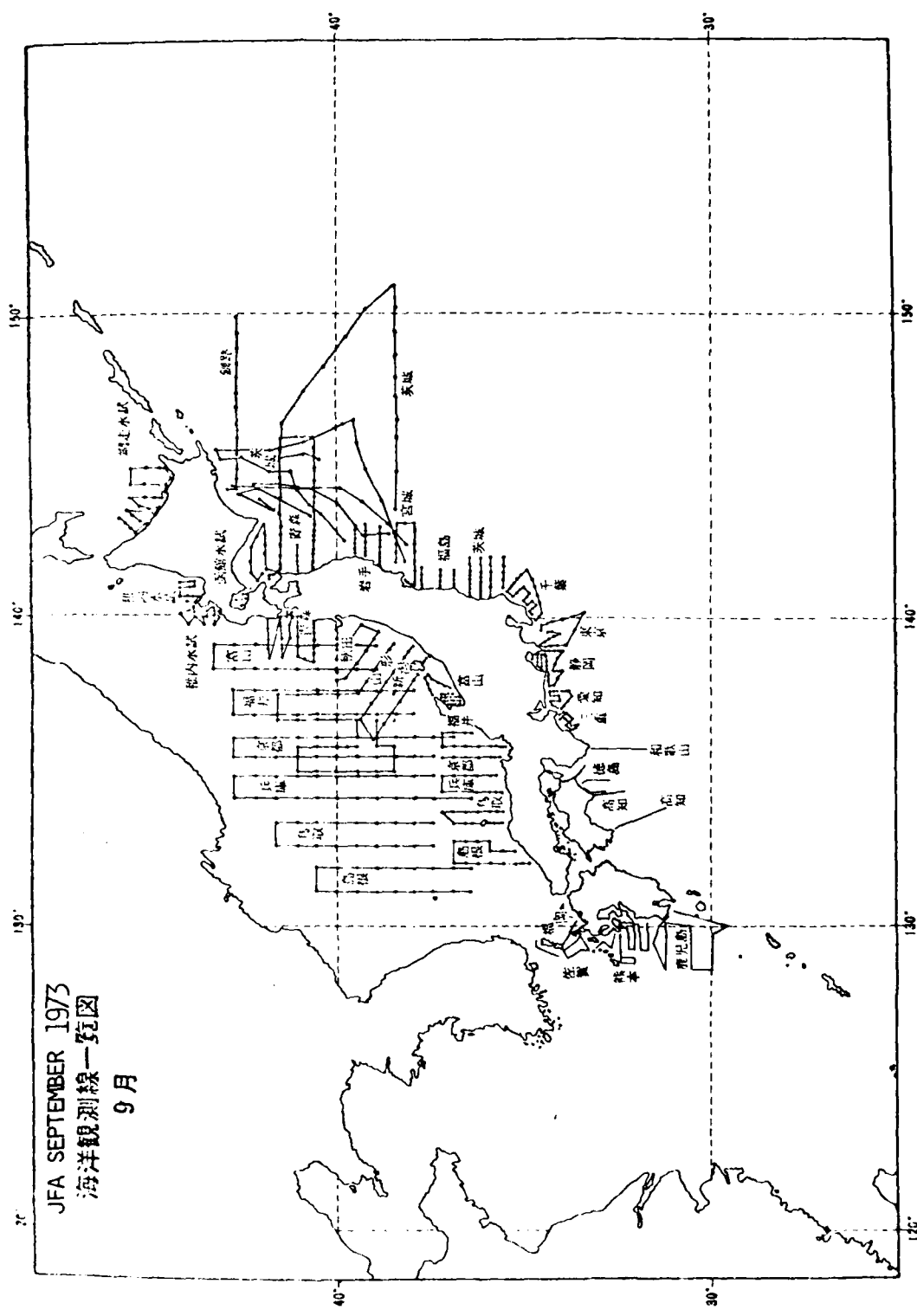


JFA APRIL 1973
 海洋観測線一覽圖
 4月

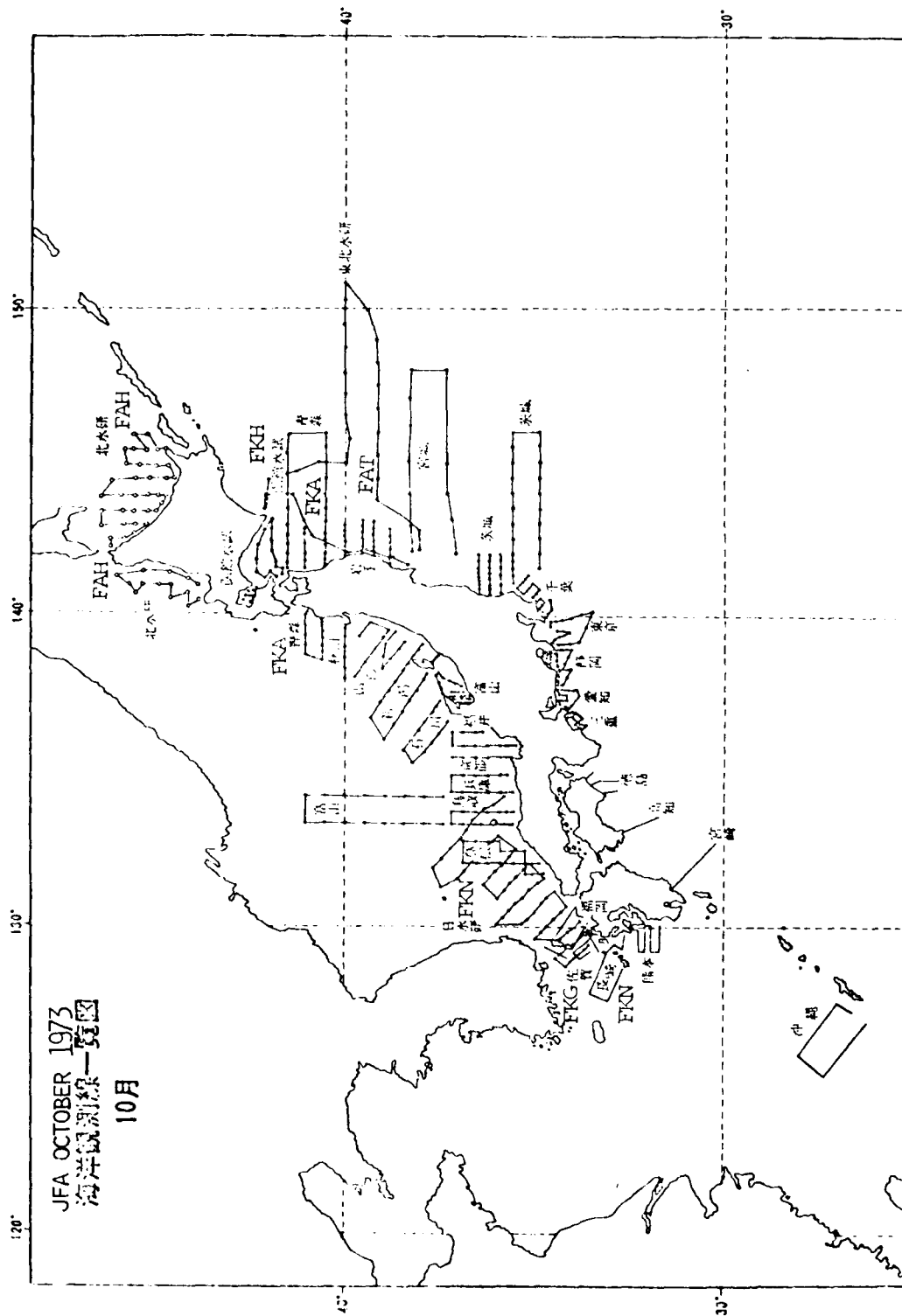
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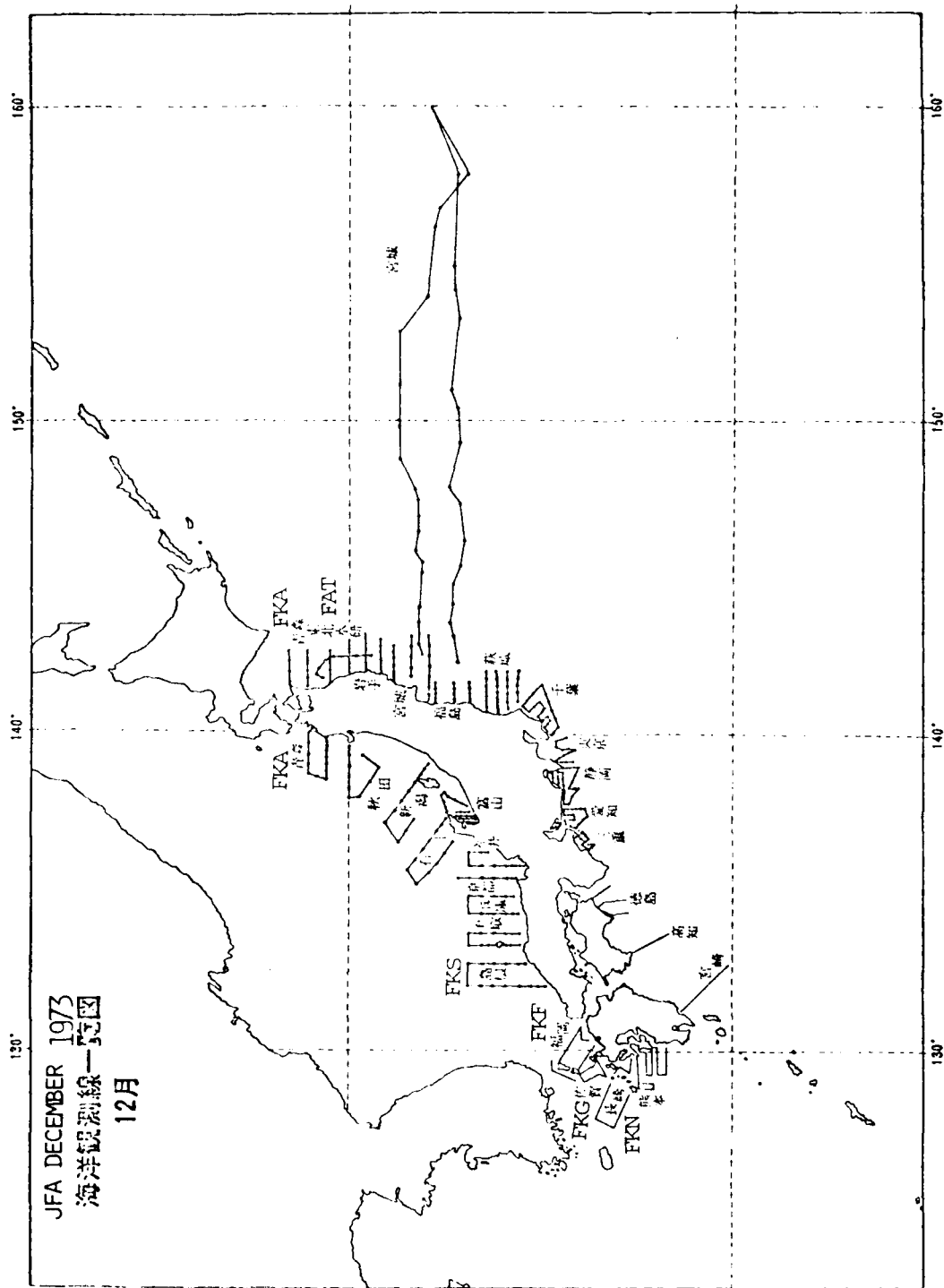
JFA JULY 1973
 海洋観測線一覽図
 7月



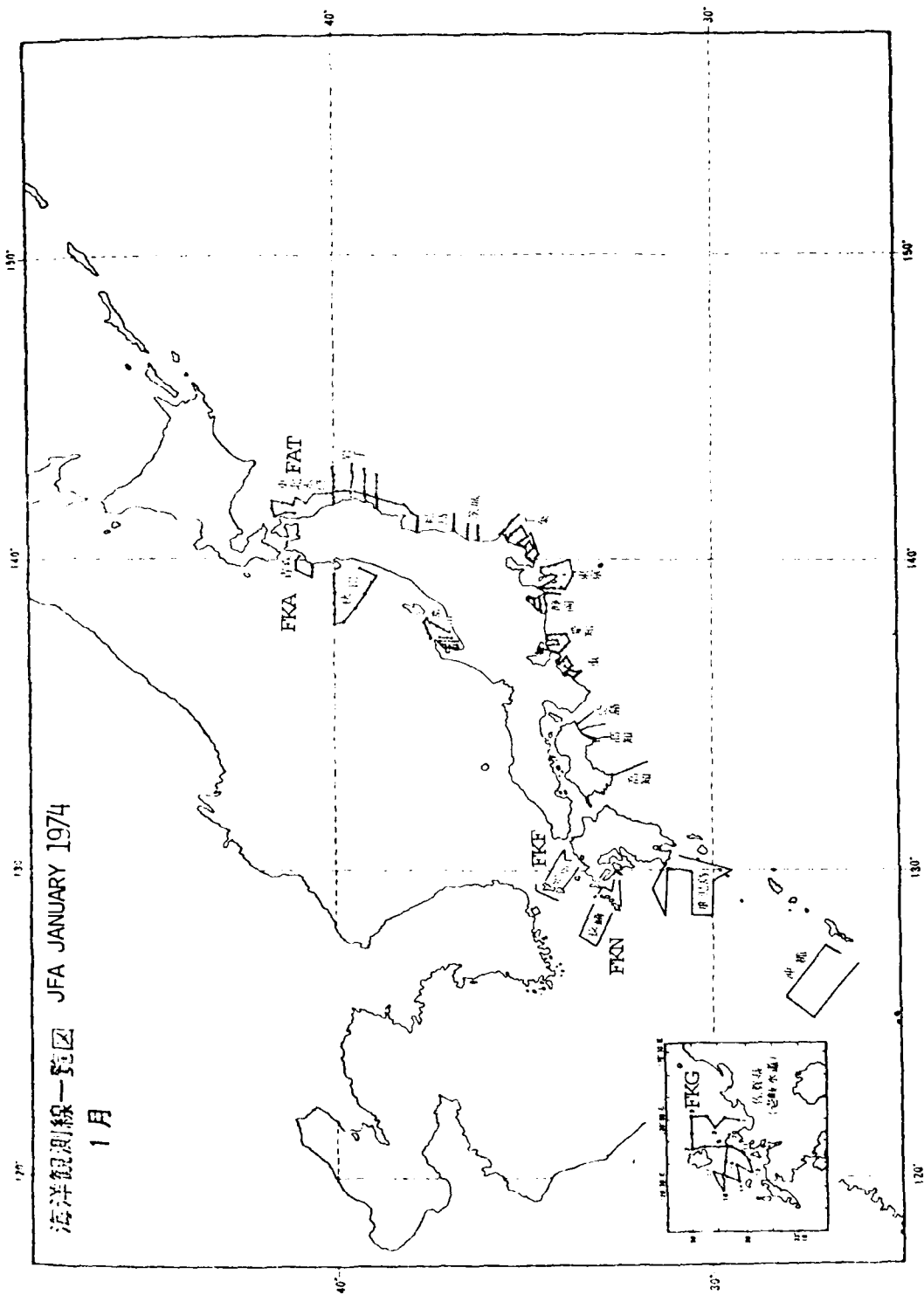
JFA SEPTEMBER 1973
 海洋観測線一覧図
 9月



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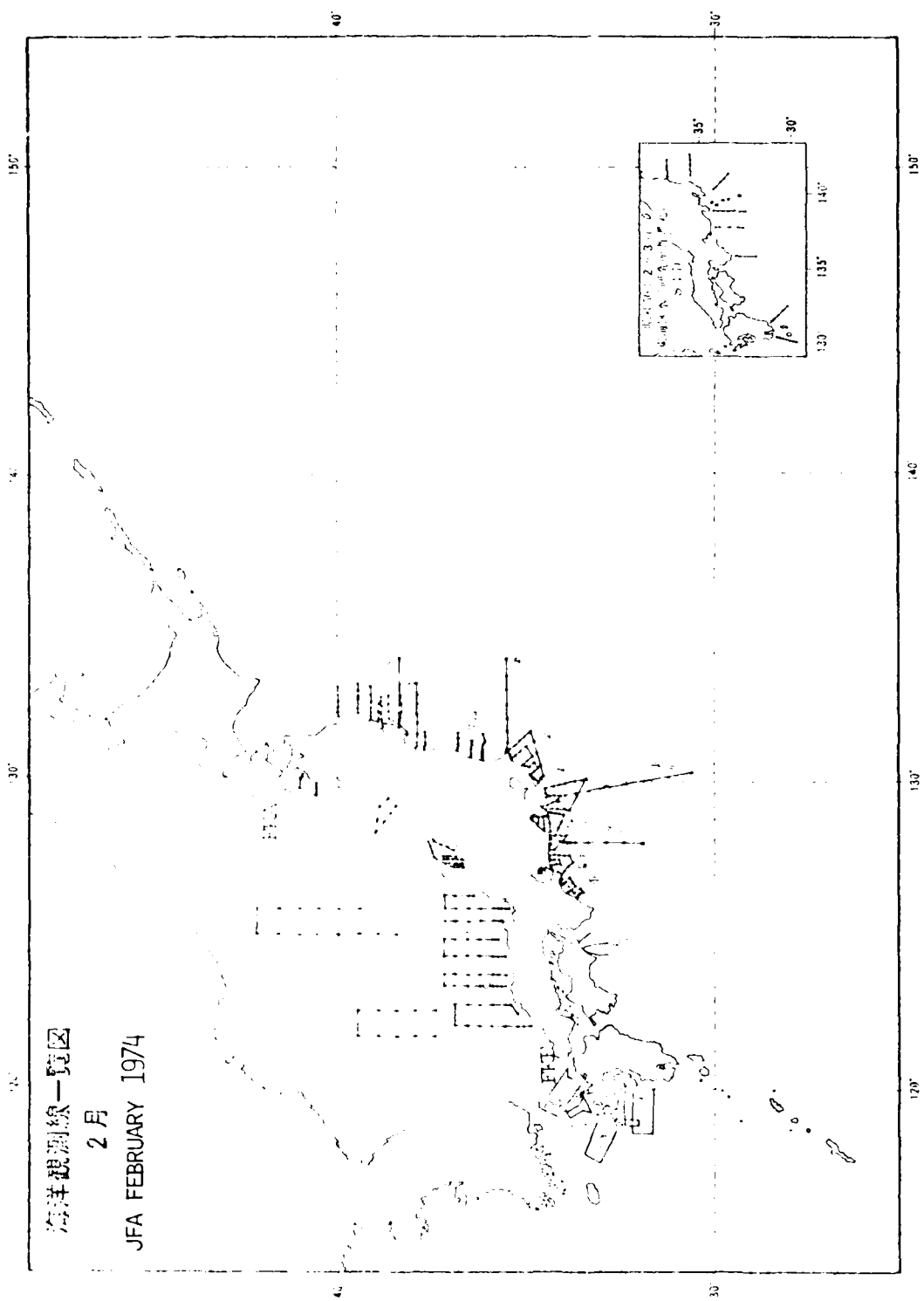
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1973



海洋観測線一覽図 JFA JANUARY 1974

1月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974

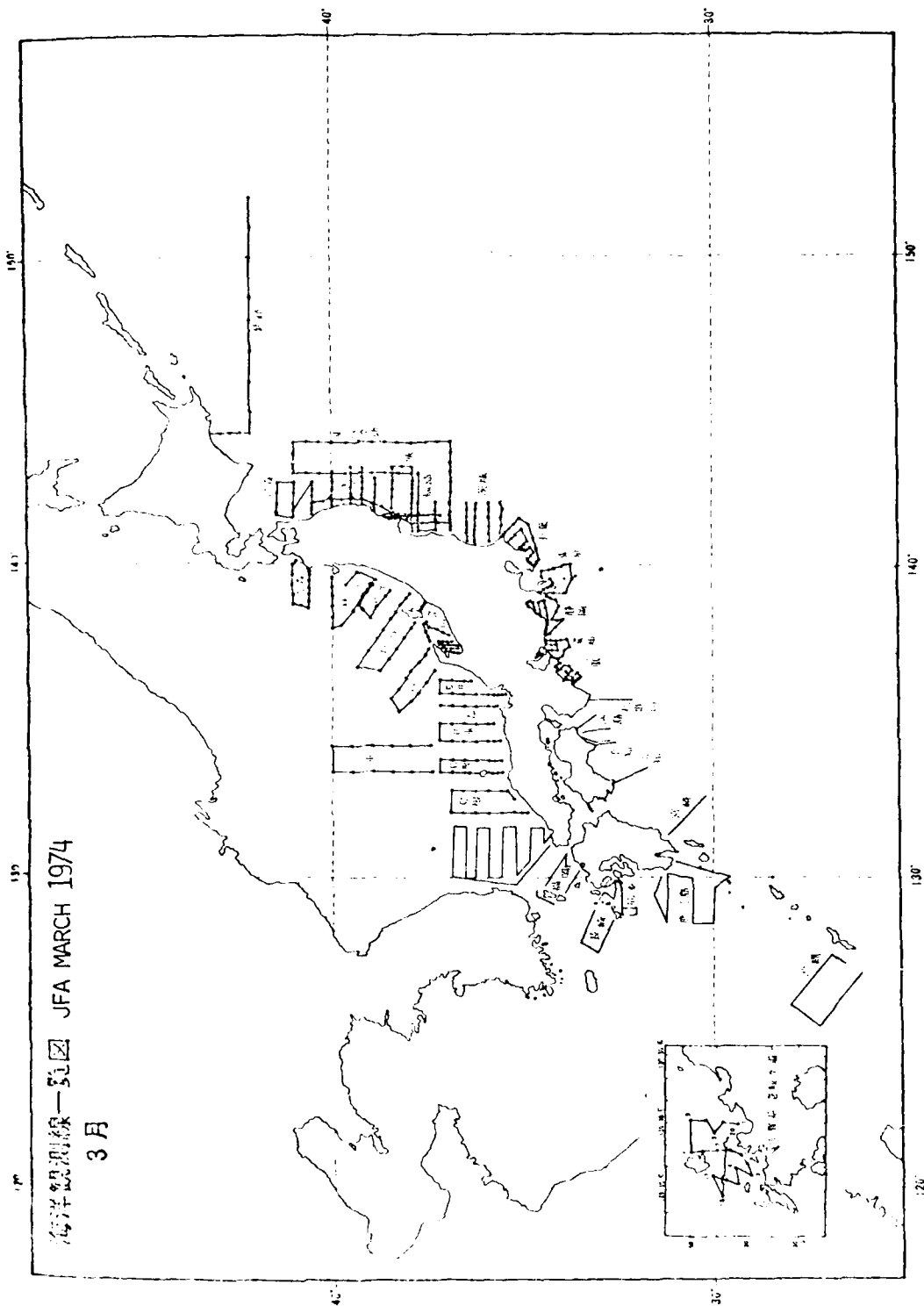


海洋観測線一覽図

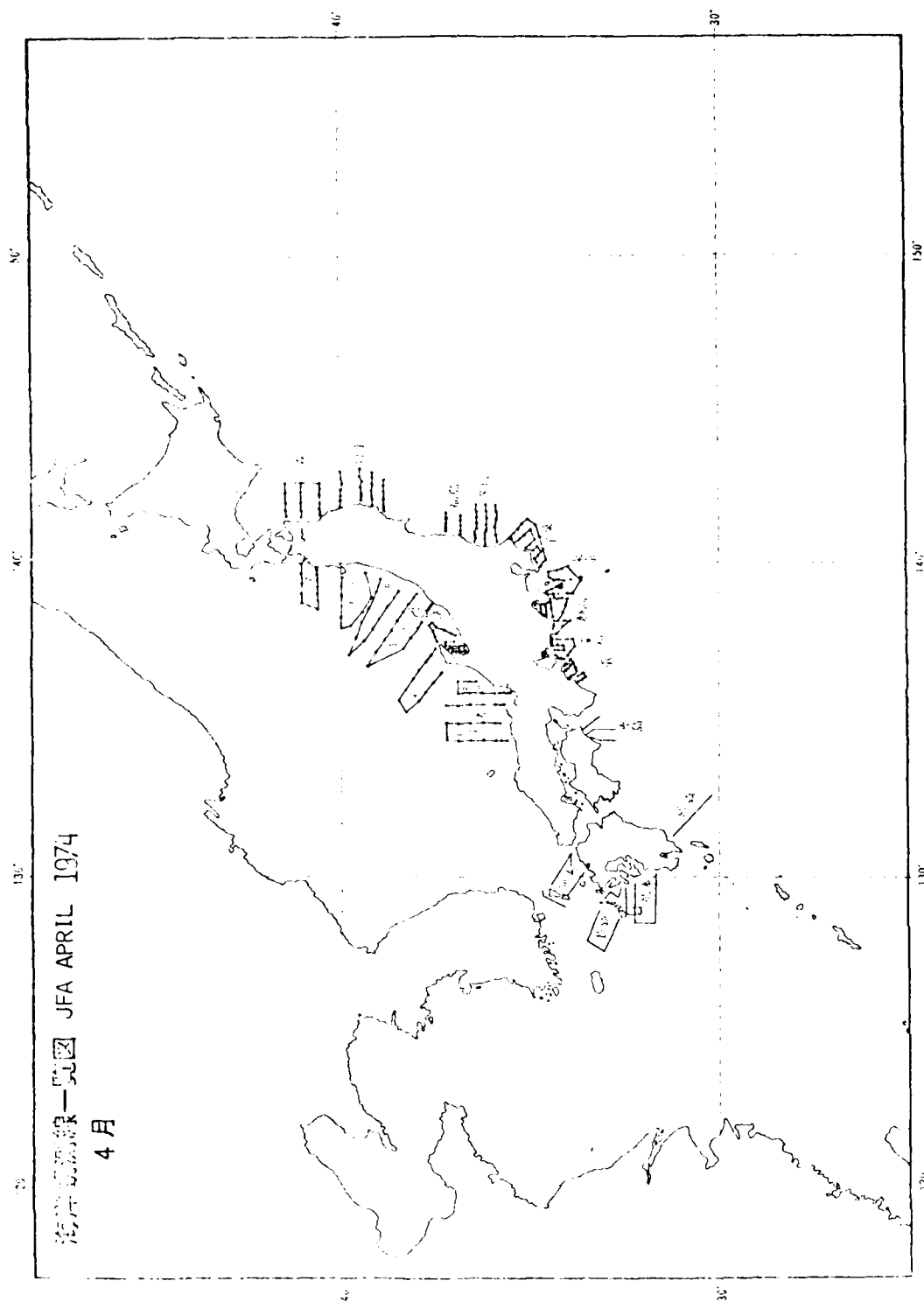
2月

JFA FEBRUARY 1974

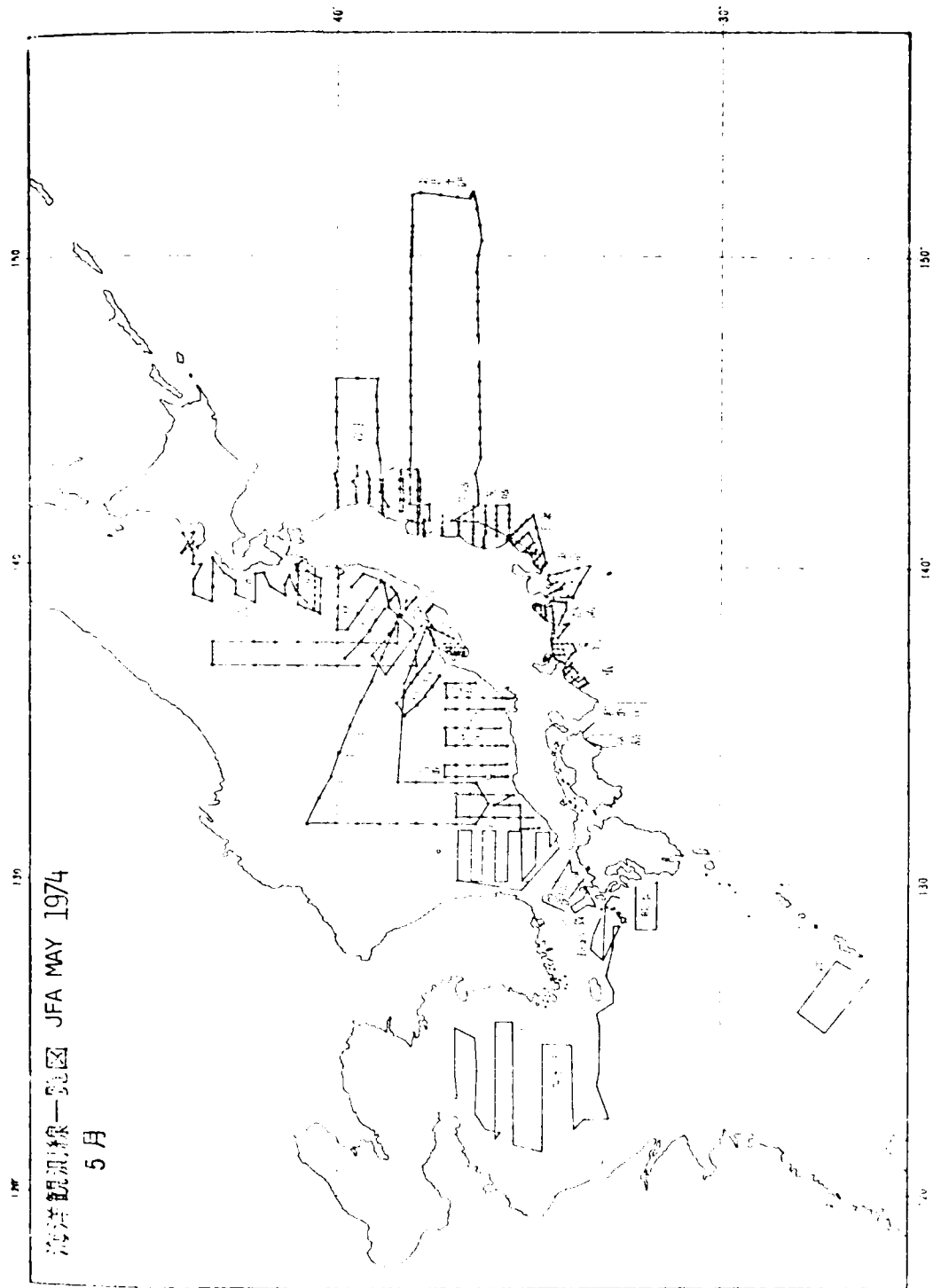
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974



CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974

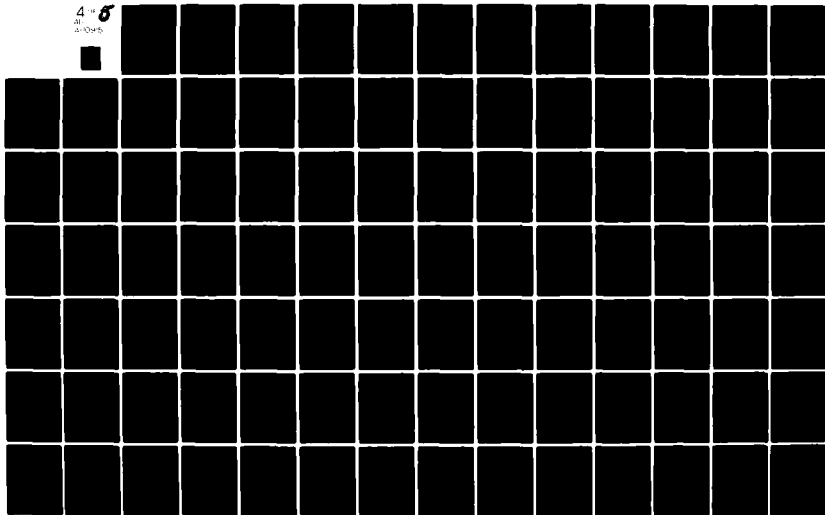


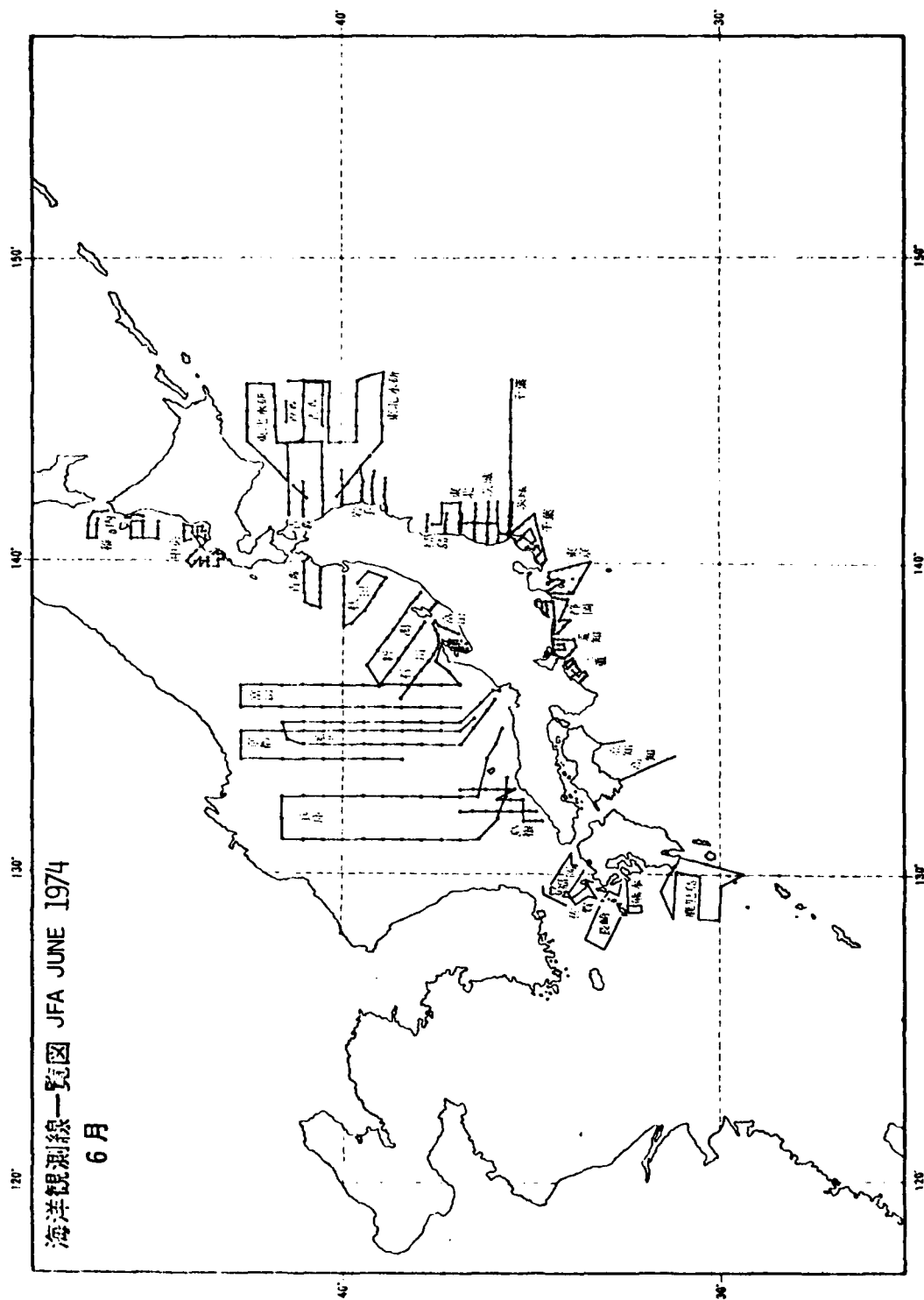
AD-A110 915

TEKMARINE INC SIERRA MADRE CA F/8 8/10
SURVEY OF SEA STRAIT DATA AROUND JAPAN. CRUISE TRACKS BY JAPANESE--ETC(U)
JUL 81 C J SONU
TEKMARINE-01/TCN-003 N00014-80-C-0039
NL

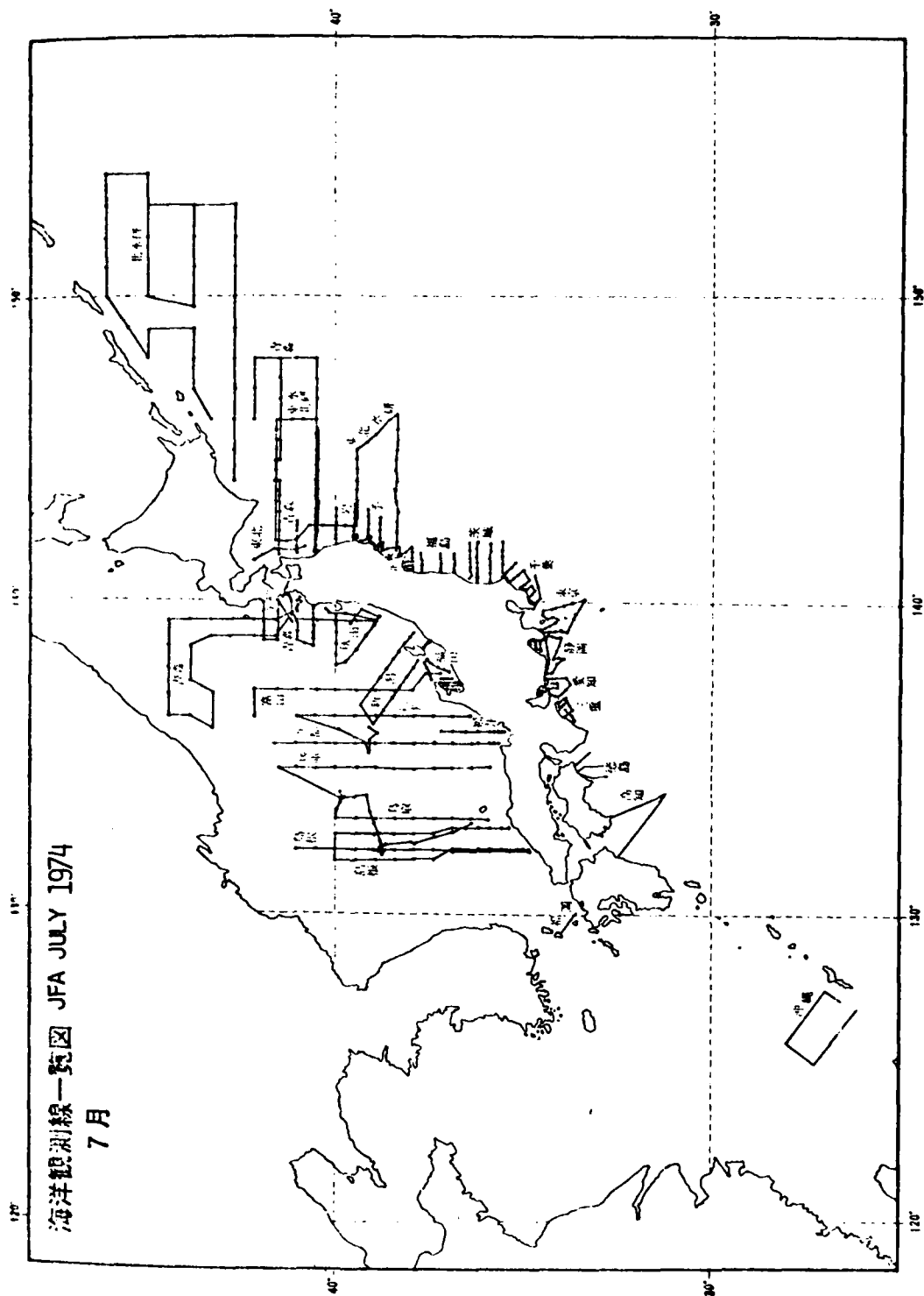
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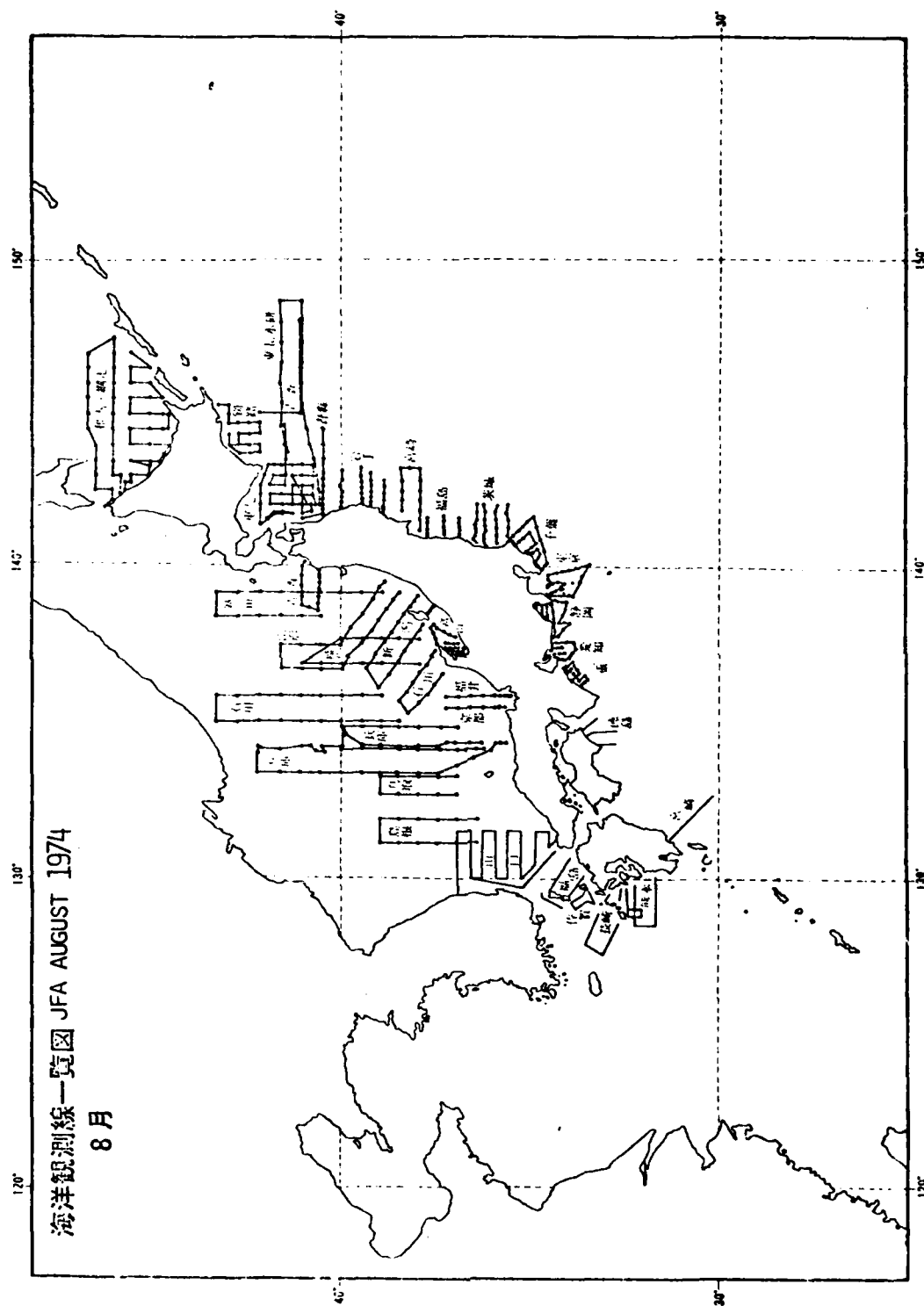




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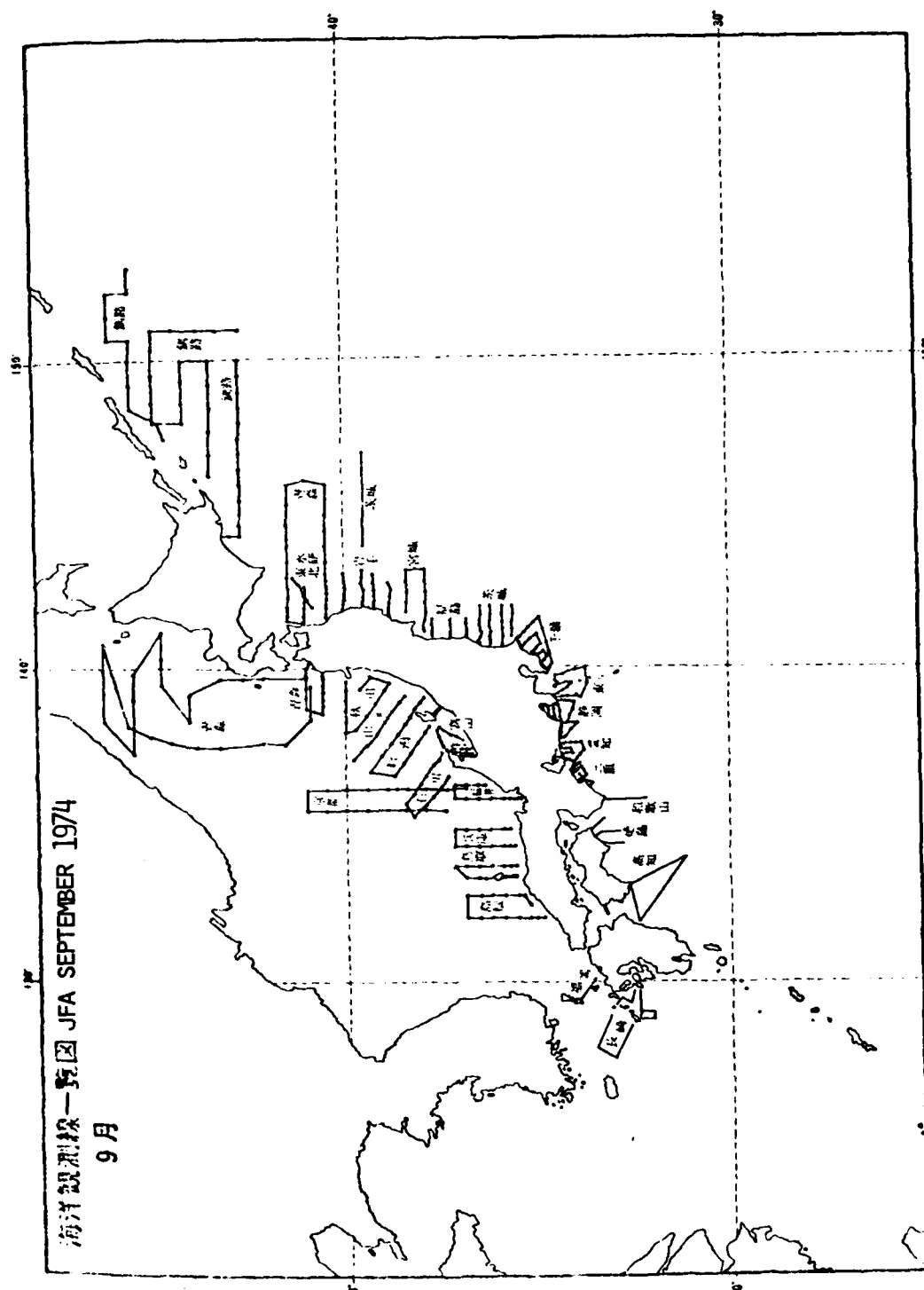
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974



海洋観測線一覽図 JFA AUGUST 1974

8月

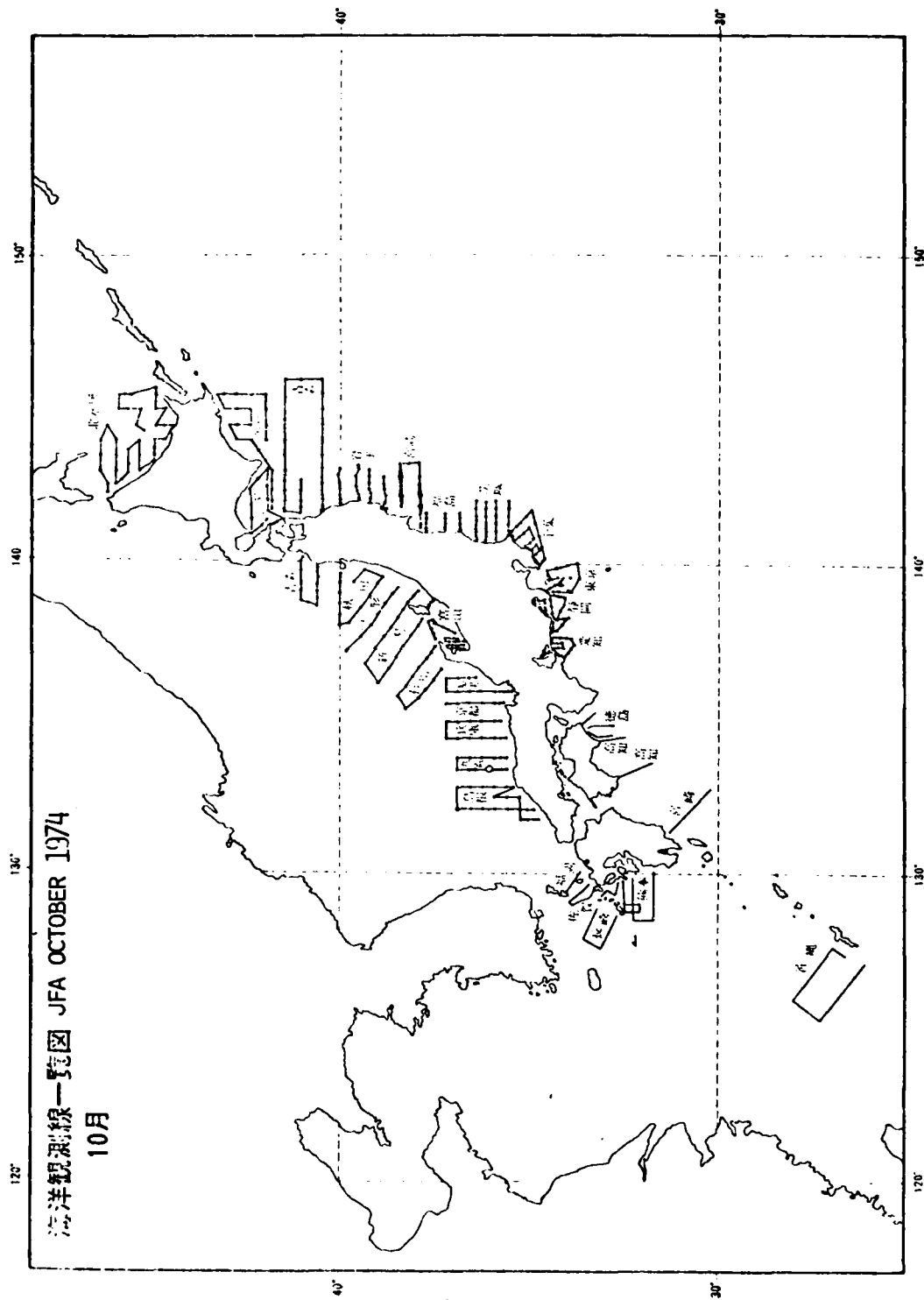
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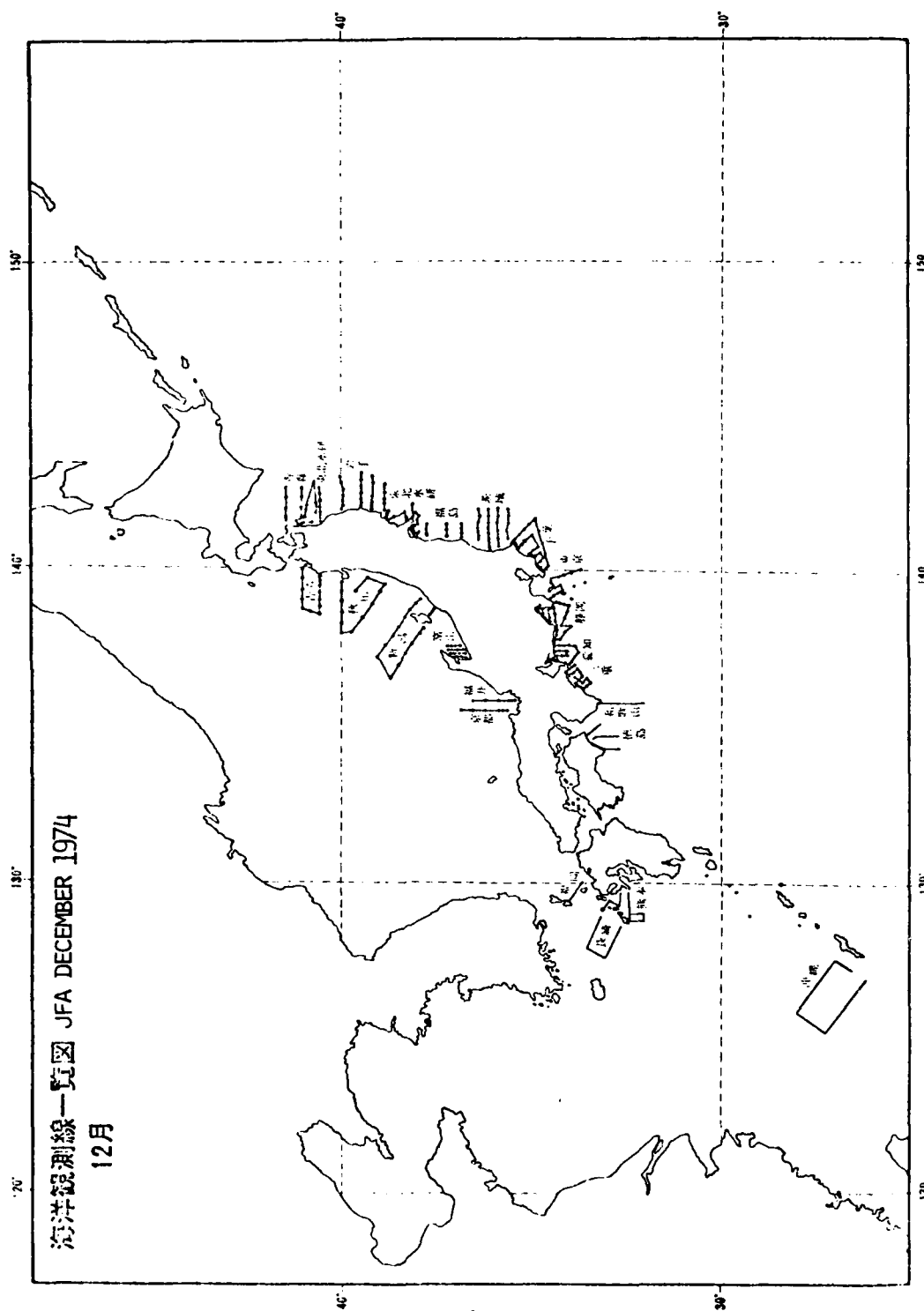
海洋観測線一覧図 JFA SEPTEMBER 1974

9月

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974

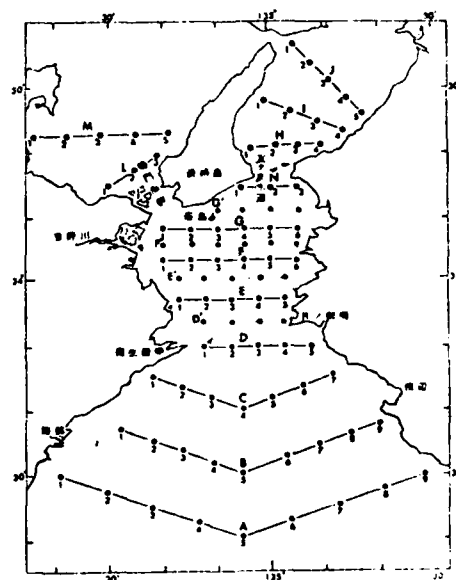
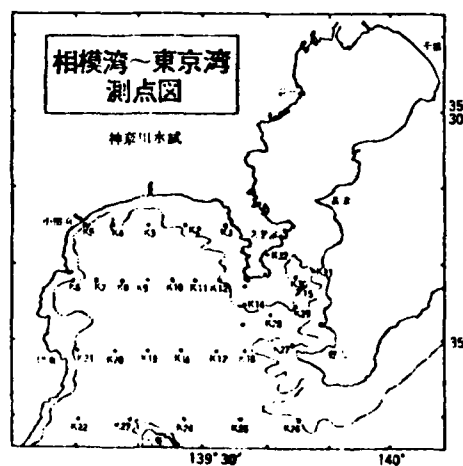
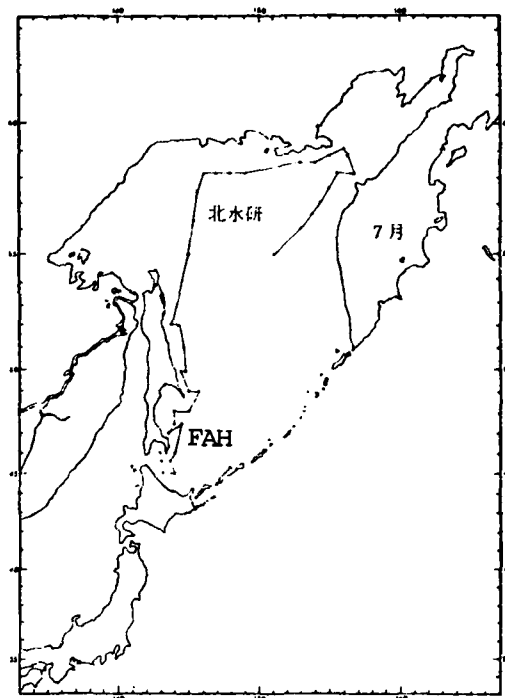
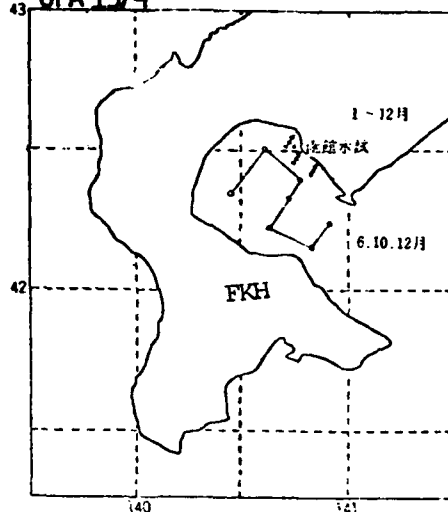


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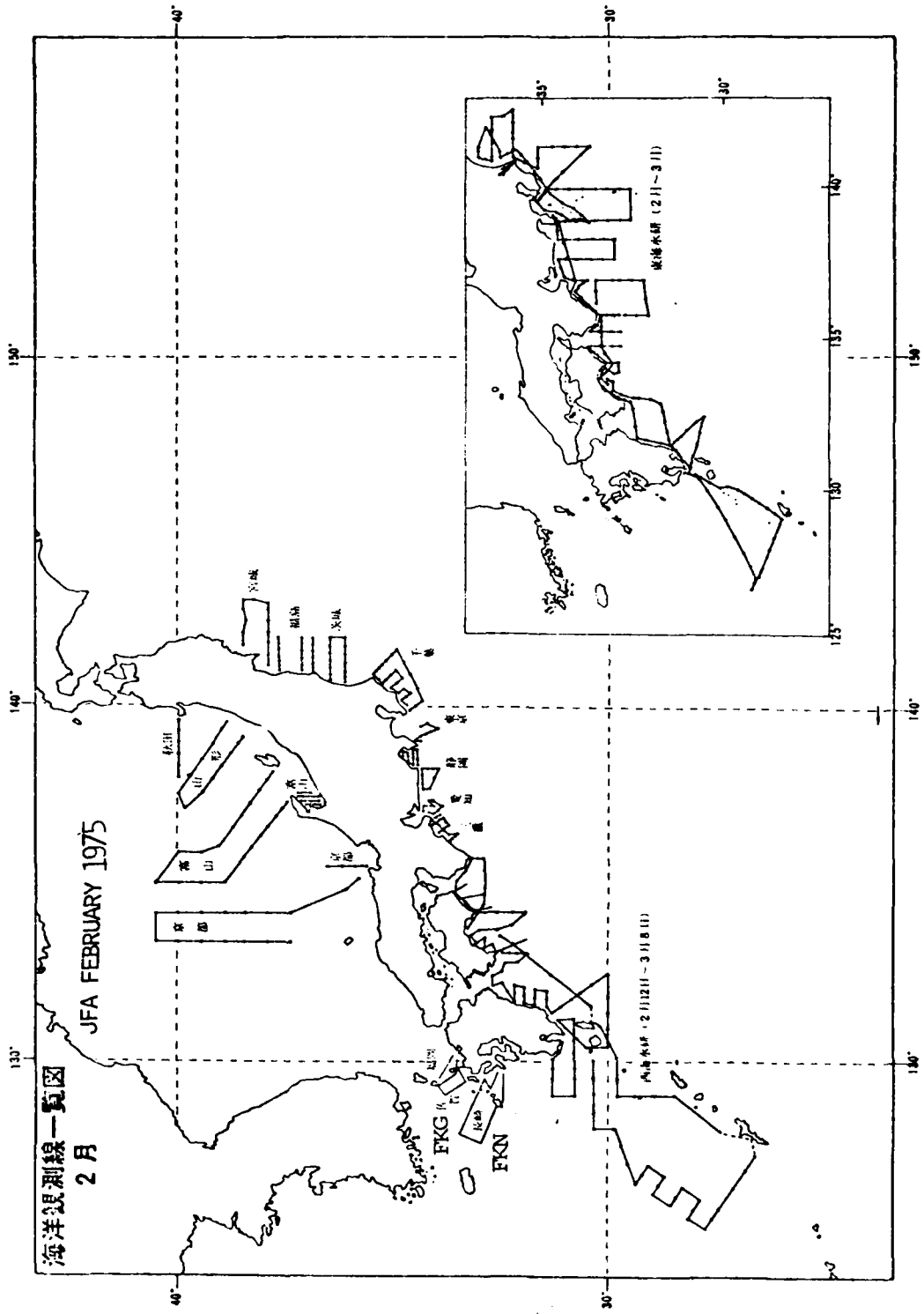
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1974

43 JFA 1974

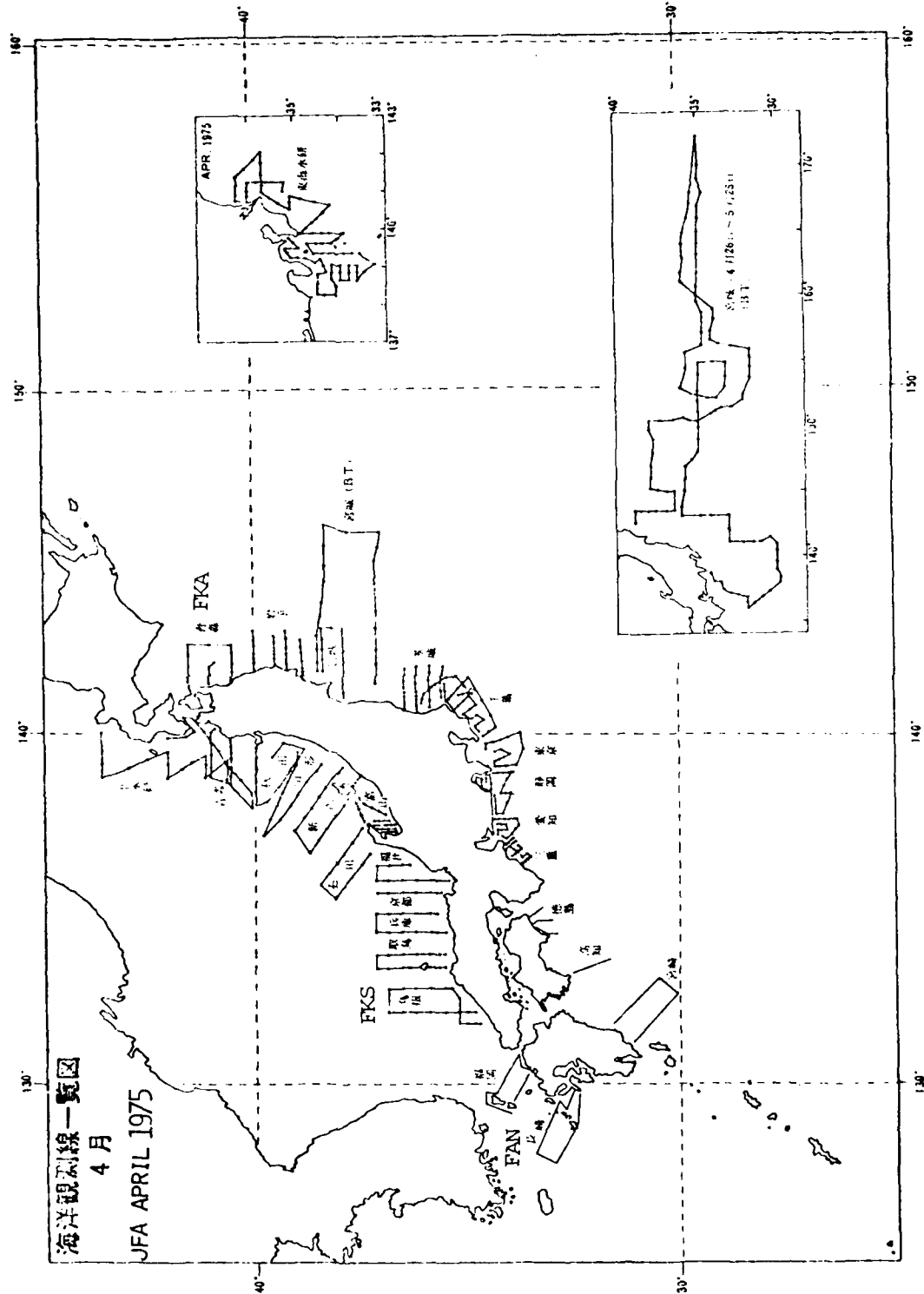


49.6.13~22 紀伊水道調査
(しらふじ丸, こたか丸, きい, とくしま)

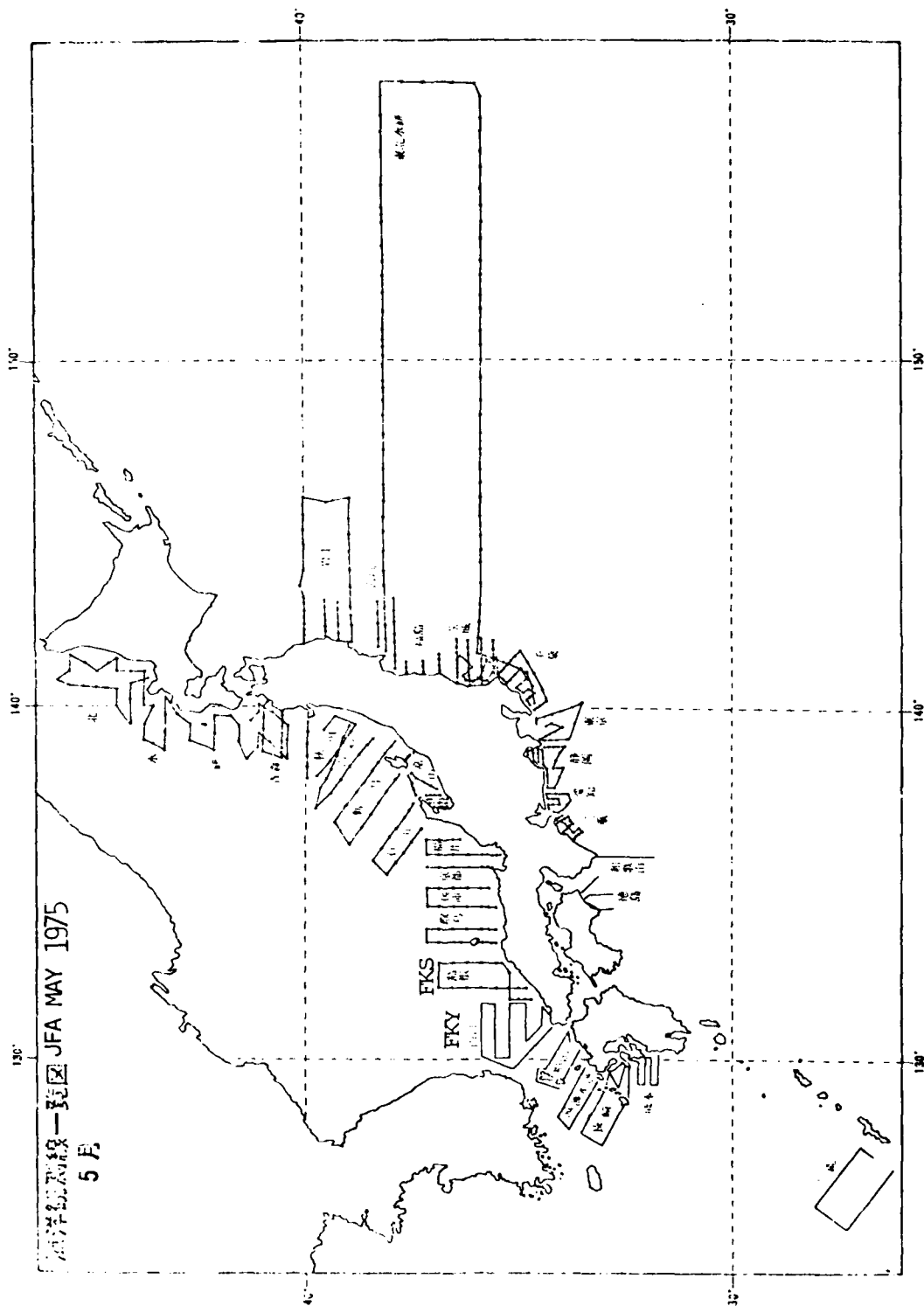
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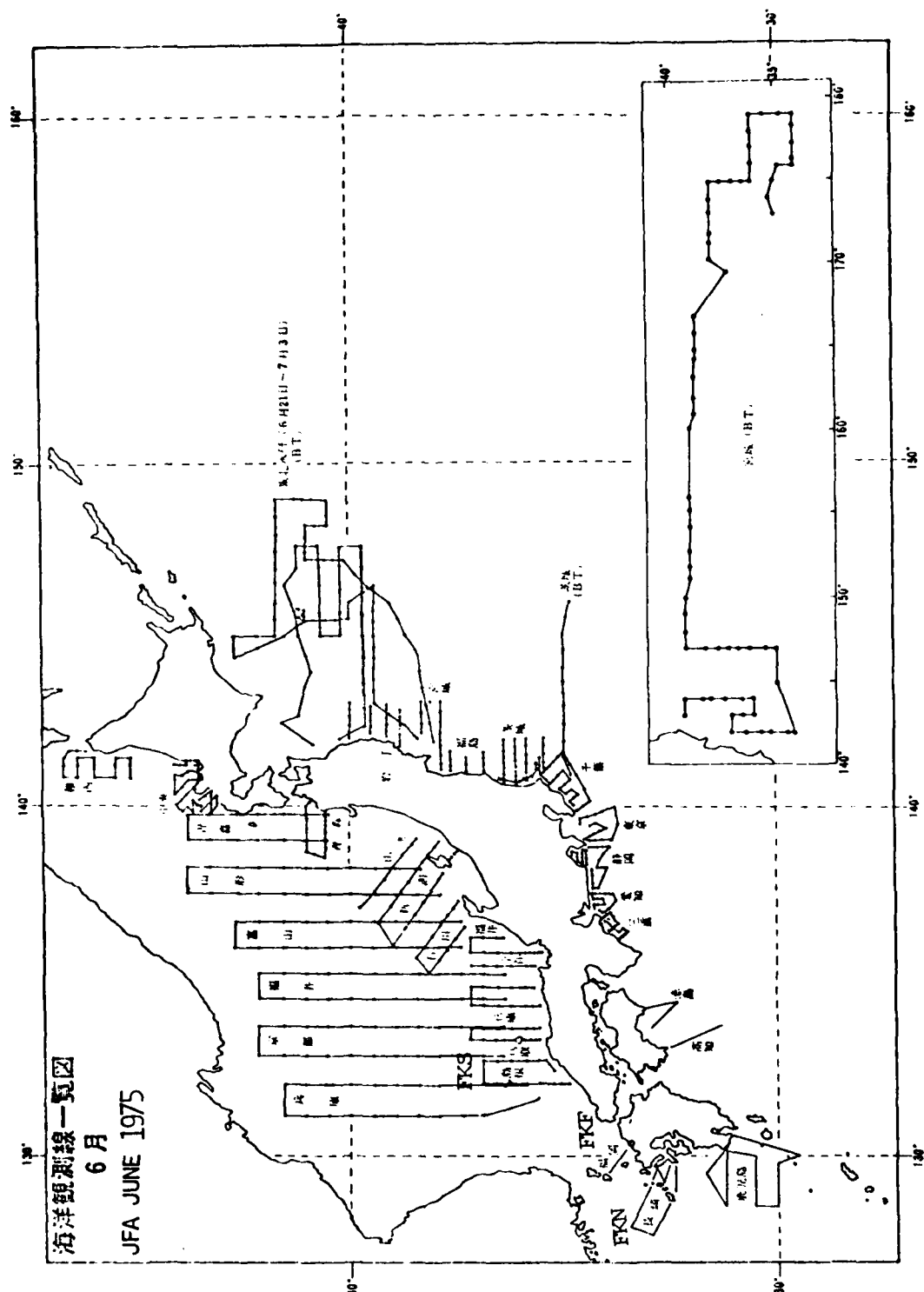
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975



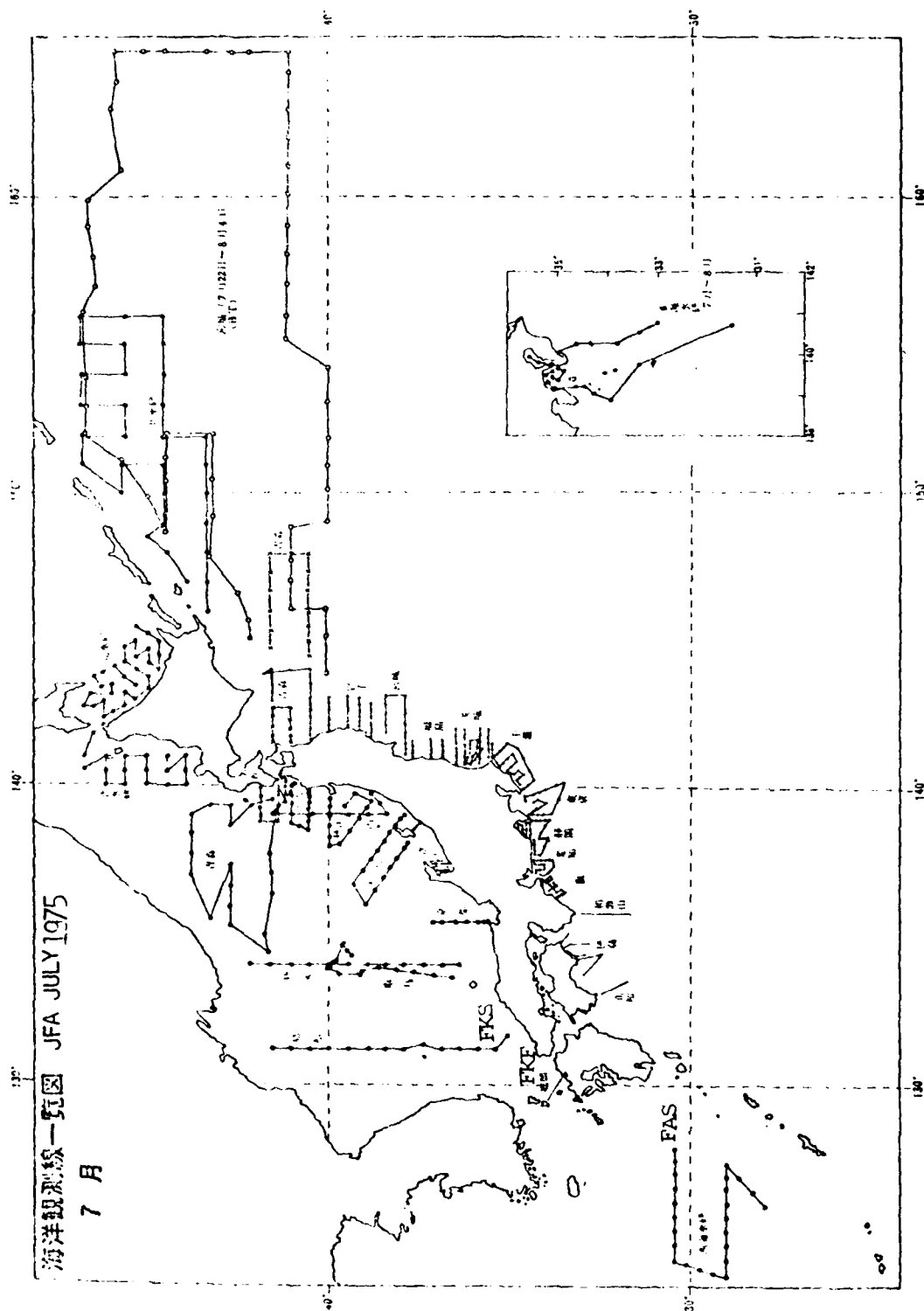
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975



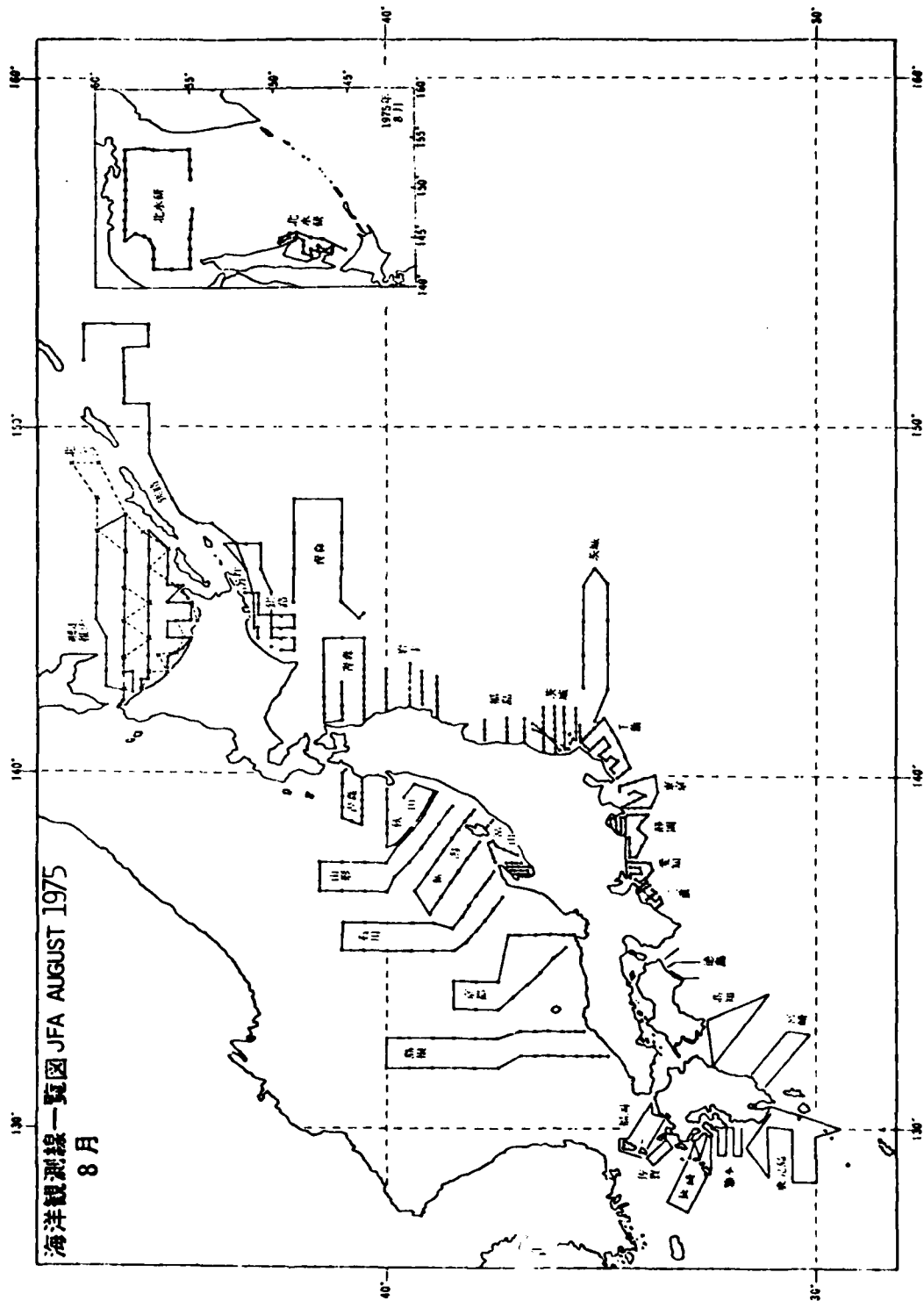
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975

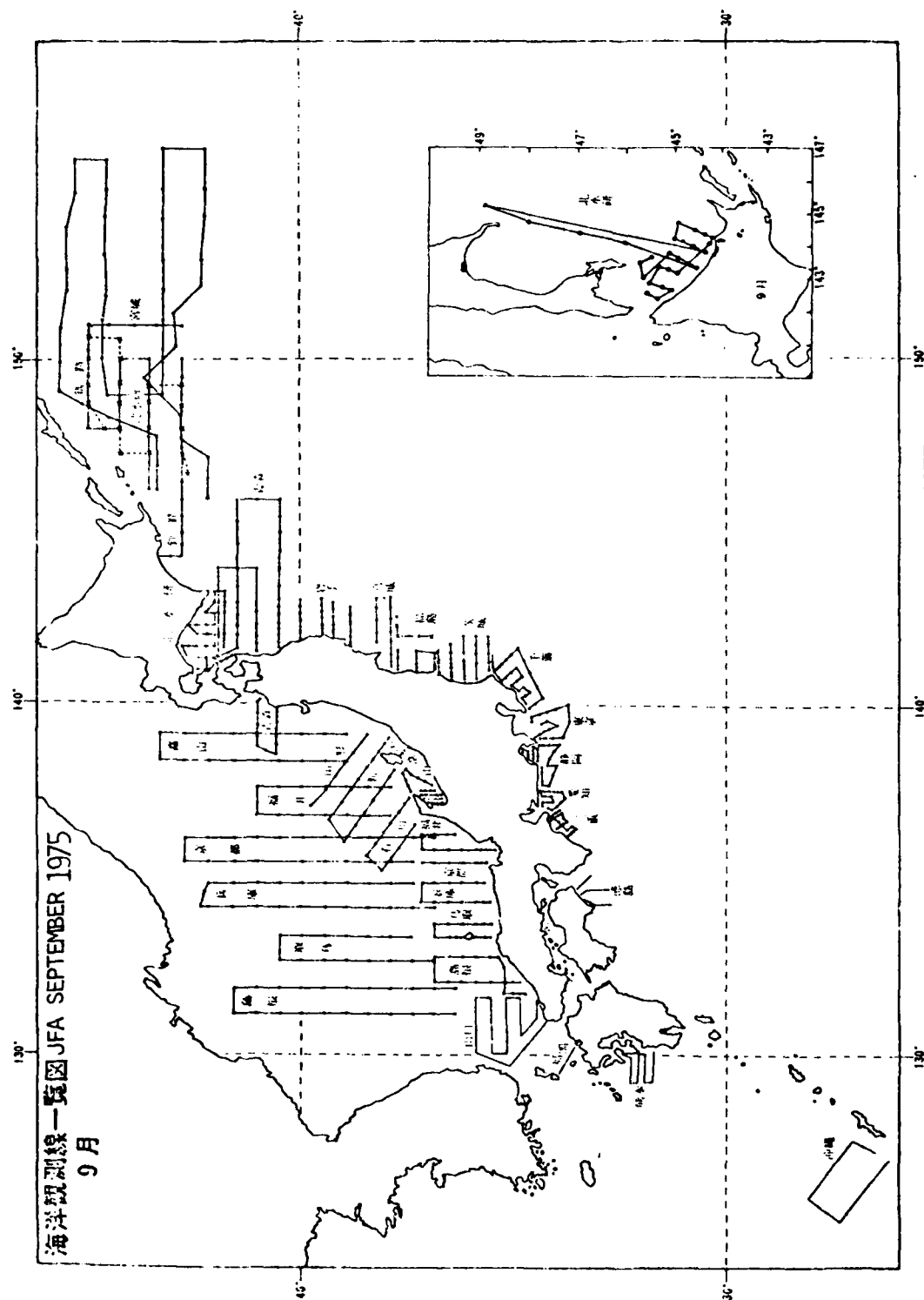


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975

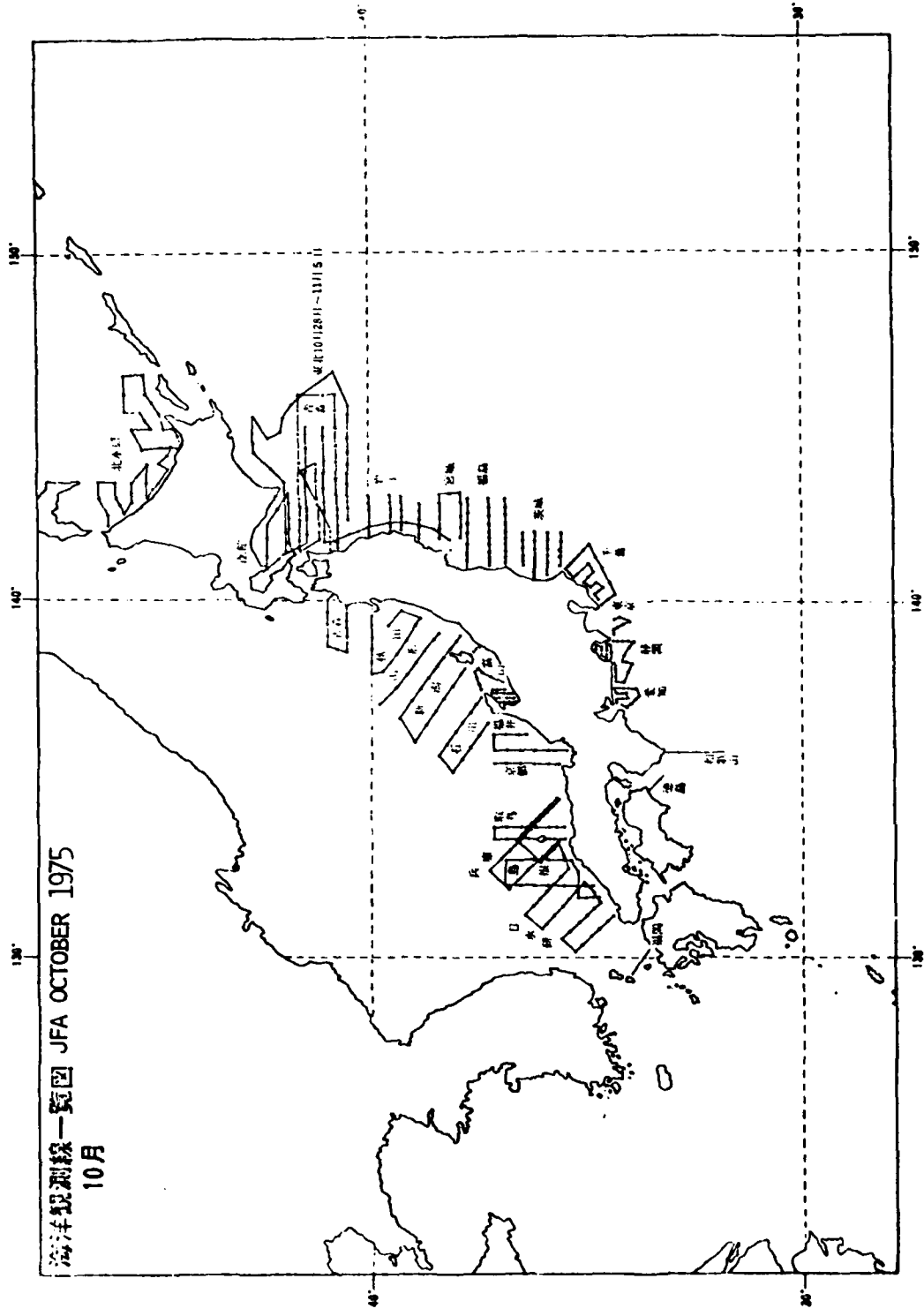


CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975

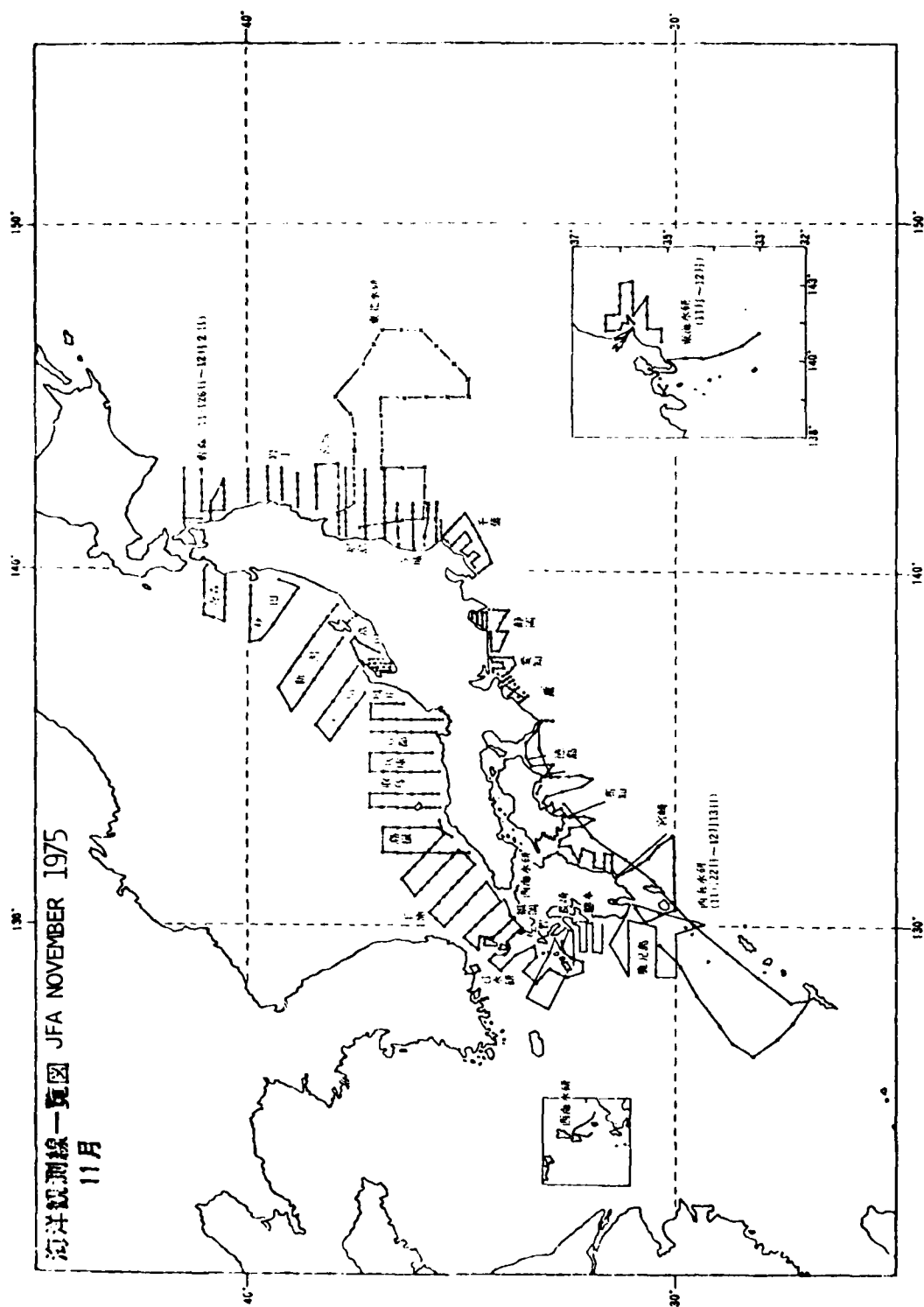




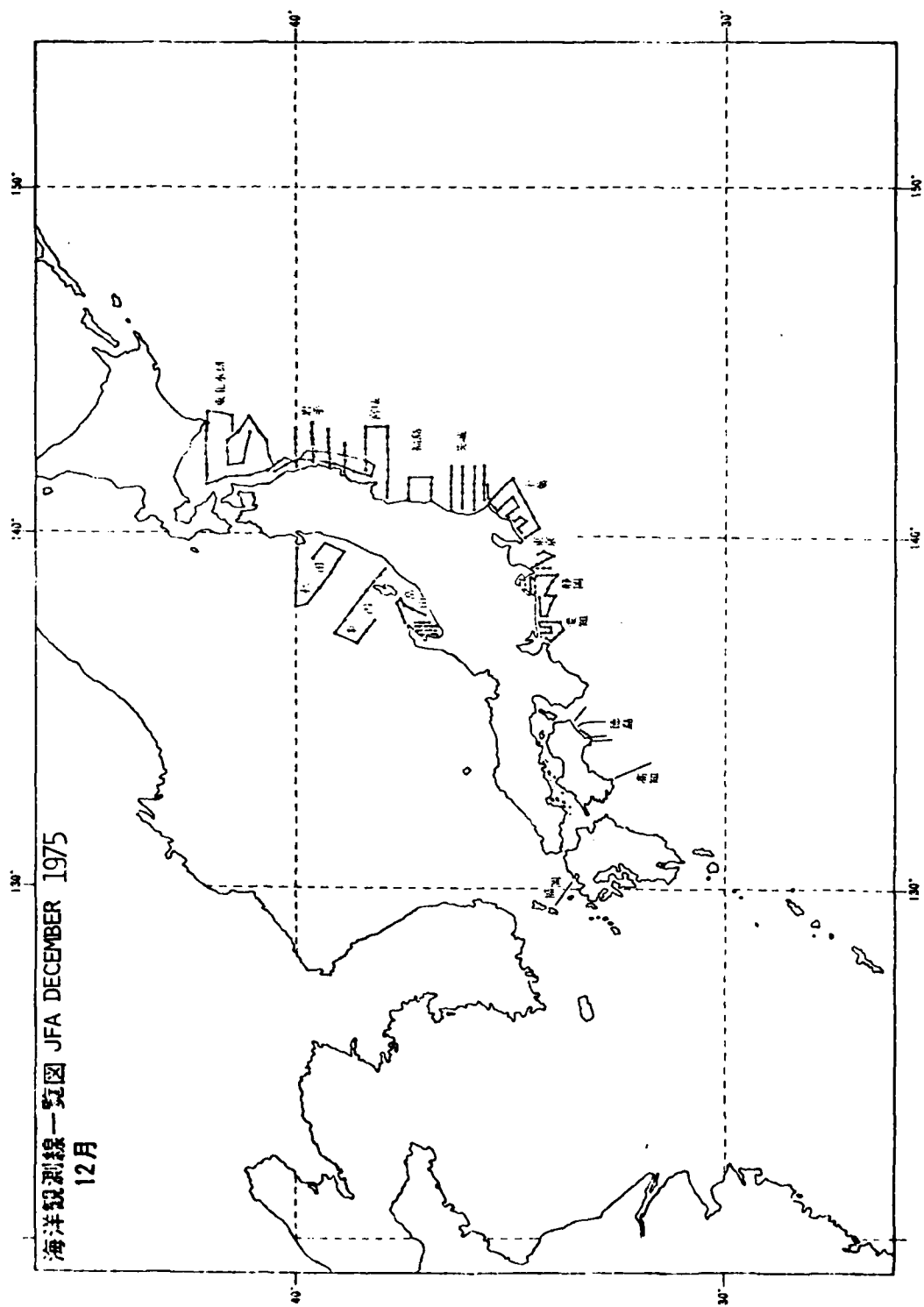
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975



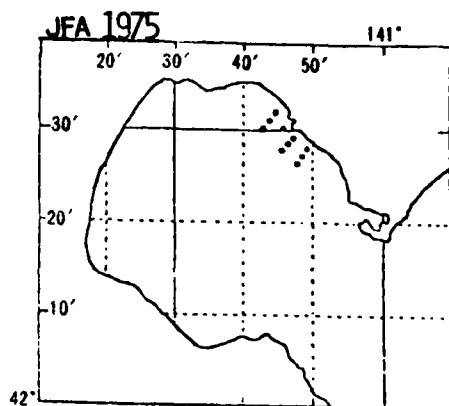
海洋観測線一覽図 JFA OCTOBER 1975
10月



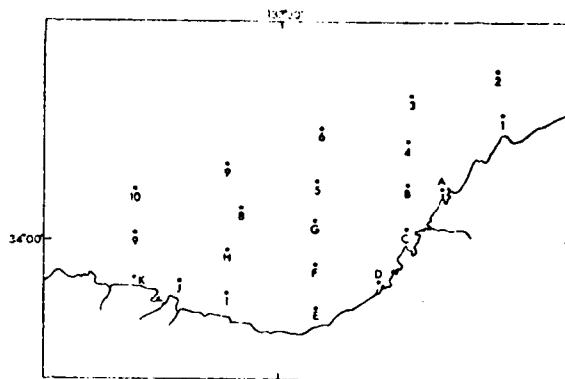
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975



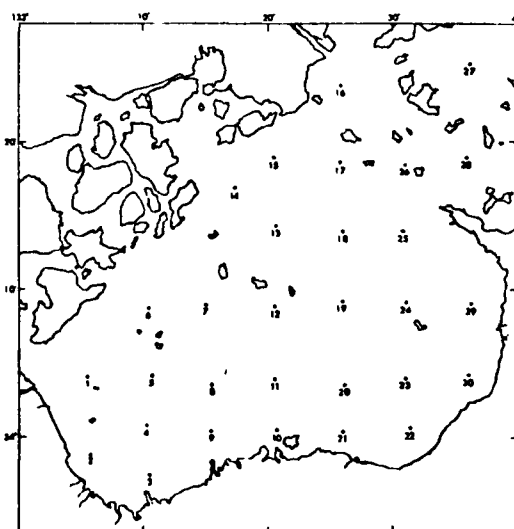
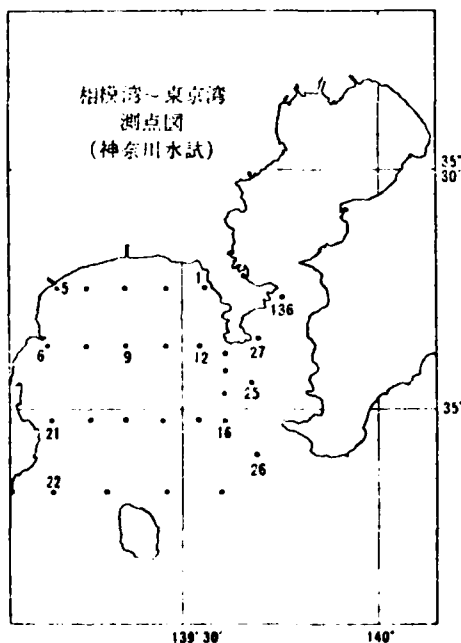
CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975



駿火湾 (1~7, 9~12月)
産卵水試



駿火湾水域 2月20日~24日、8月21日~25日



駿火湾水域 2月20日~24日、8月21日~25日

CRUISE TRACKS BY JAPAN FISHERIES AGENCY, YEAR 1975

APPENDIX 3

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY

OCEANOGRAPHIC CRUISE CHARTS
1952 - 1978
JAPAN METEOROLOGICAL AGENCY

APPENDIX 3

Cruise Tracks by Japan Meteorological Agency

Introduction

Included in this appendix are the serial oceanographic survey cruise tracks which have been occupied by the survey vessels of the Japan Meteorological Agency since 1952. Also included are other pertinent information which, along with the cruise tracks, would enable an investigator to quickly assess the extent of data available at a region of interest as well as the data reports in which such data can be accessed. For a tabulation of cruise information on file with the NAVOCEANO OERS (Oceanographic Environmental Reference Service), see Table 3-2.

The Japan Meteorological Agency (called "Kisho-Cho") operates with five service arms: its headquarters (Tokyo), and four Marine Meteorological Observatories each located at Hakodate, Kobe, Nagasaki, and Maizuru.

Table A3-1 shows jurisdictional divisions of the regional Marine Meteorological Observatories along with their respective identity code used in the NAVOCEANO OERS Cruise Inventory. For a complete tabulation of JMO cruise information on file with the OERS (Oceanographic Environmental Reference Service), see Table 3-2.

The JMA is interested in a broad range of oceanographic data, and its cruises routinely covers temperature, salinity, nutrient salts, currents (GEK), plankton samples, and various marine meteorological parameters. According to a recent tally by the JODC, the JMA has been collecting for more serial data but less GEK data than the JHD:

<u>Agency</u>	<u>Data Period</u>	<u>Serial Stations</u>	<u>GEK Stations</u>
JMO	1947 - 79	61,426	37,021
JHD	1923 - 79	7,144	79,111
JFA	1933 - 79	113,069	12,995

JMA Cruises

Typical cruise tracks by the JMA are shown in Figure A3-1. The codings identifying the participating regional observations are explained in Table A3-1.

Annotations

The JMA cruise charts are organized in 4 charts to a year, giving a summary of cruises during each of the three-month periods January-March, April-June, July-September and October-December. The chart generally indicates the name of the ships. Each Marine Meteorological Observatory has traditionally retained the same names for its generations of ships, hence the ship's name is synonymous with a specific observatory:

JMA Headquarters:	Ryofu Maru Keifu Maru
Hakodate M.M.O. :	Yushio Maru Kofu Maru
Kobe M.M.O. :	Shumpu Maru (or Syumpu Maru)
Nagasaki M.M.O. :	Chofu Maru
Maizuru M.M.O. :	Seifu Maru

Data Reports

The data reports containing the results of serial observations by the JMA are summarized in Table A3-2. Each issue of the reports lists data in groupings of six months for either January-June or July-December.

The data reports which list the JMA serial observational data are:

"The Results of Marine Meteorological
and Oceanographic Observations"

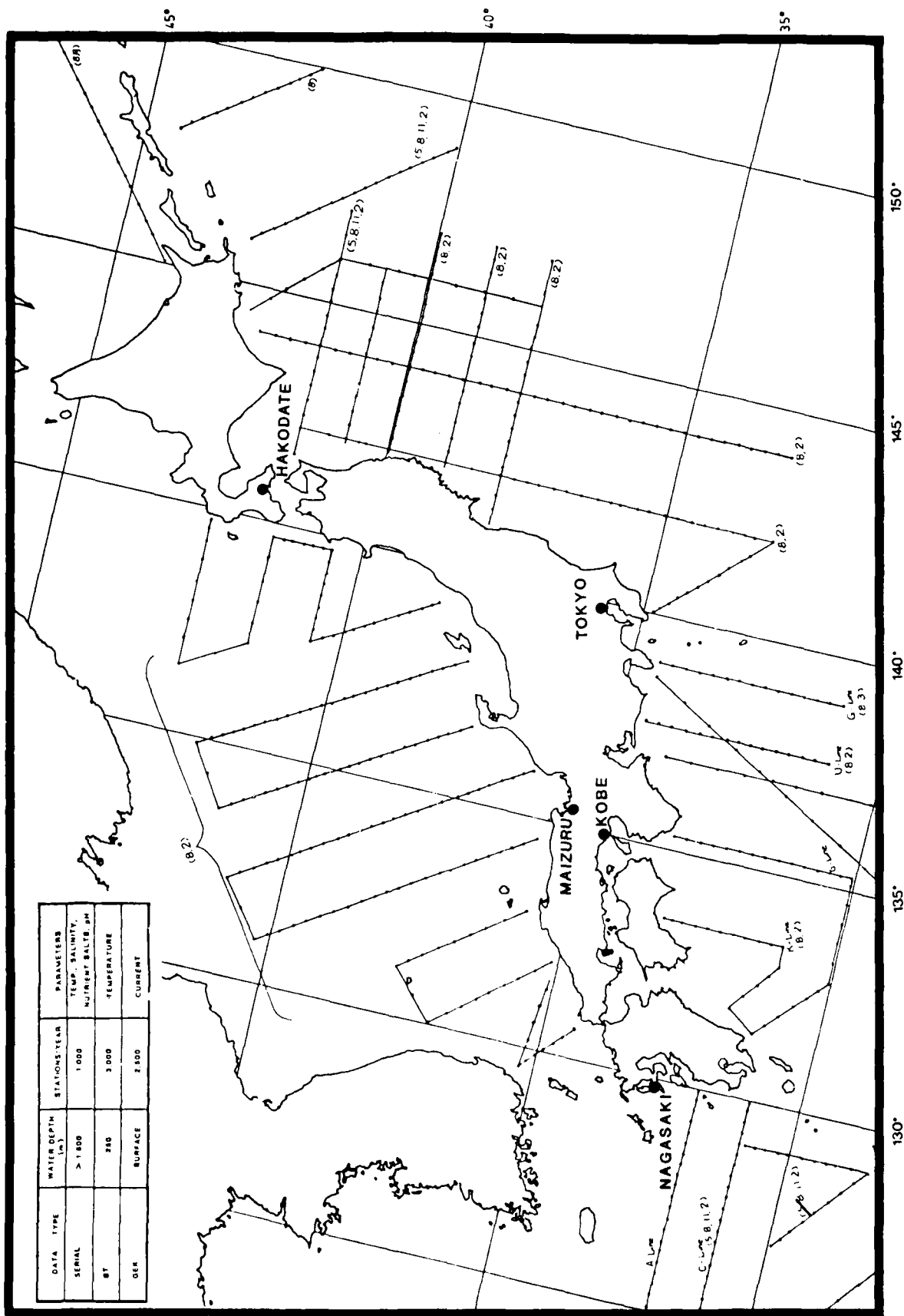


Figure A3-1: Typical cruise tracks for serial observations by Japan Meteorological Agency (JMA).

TABLE A3-1: Principal agencies engaged in serial oceanographic observation

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN HYDROGRAPHIC OFFICE</u>			
Headquarters	Tokyo	-0	All waters.
Region No. 1	Otaru	-1	Tsugaru & Soya, both up- & down-stream.
No. 2	Shiogama	-2	Tsugaru, mainly downstream and off San-riku coasts.
No. 3	Yokohama	-3	Pacific Ocean.
No. 4	Nagoya	-4	Pacific Ocean.
No. 5	Kobe	-5	Pacific Ocean.
No. 6	Hiroshima	-6	Seto Inland Sea.
No. 7	Kitakyushu	-7	Tsushima, upstream on East China Sea.
No. 8	Maizuru	-8	Tsushima, downstream on Sea of Japan.
No. 9	Niigata	-9	Tsushima downstream and Tsugaru upstream, on Sea of Japan.
No.10	Kagoshima	-10	Pacific Ocean & East China Sea.
No.11	Naha	-11	Pacific Ocean & East China Sea.
<u>JAPAN FISHERIES AGENCY</u>			
Headquarters	Tokyo		Administrative.
<u>Fisheries Research Laboratory</u>			
Hokkaido	Yoichi	FAH	Tsugaru & Soya, both up- & down-stream.
Tohoku	Shiogama	FAT	Tsugaru, downstream on Pacific Ocean.
Tokai	Tokyo	-	Pacific Ocean.
Nankai	Kochi	-	Pacific Ocean.
Seikai	Nagasaki	FAS	Tsushima, upstream on East China Sea.
Nihonkai	Niigata	FAN	Tsushima, downstream on Sea of Japan.
Naikai	Hiroshima	-	Seto Inland Sea.

(TO CONTINUE)

TABLE A3-1: Principal agencies engaged in serial oceanographic observation
(Cont'd)

REGION	OFFICE	INVENTORY CODE	RELEVANT SEA STRAIT
<u>JAPAN METEOROLOGICAL AGENCY</u>			
Headquarters	Tokyo	MAQ	All waters.
<u>Marine Meteorological Observatory</u>			
Hakodate	Hakodate	MAH	Tsugaru & Soya, downstream on Pacific Ocean and Sea of Okhotsk.
Kobe	Kobe	MAK	Mainly, Pacific Ocean.
Nagasaki	Nagasaki	MAN	Tsushima, upstream on East China Sea.
Maizuru	Maizuru	MAM	Tsushima, downstream on Sea of Japan.
<u>PREFECTURAL FISHERIES EXPERIMENT STATIONS</u>			
Hakodate	Hakodate	FKH	Tsugaru, up- & down-stream. Soya upstream.
Wakkanai	Wakkanai	FKW	Soya, channel and downstream.
Abashiri	Abashiri	FKA	Soya, downstream.
Kushiro	Kushiro	FKK	Tsugaru, far downstream.
Chuo (Hokkaido)	Yoichi	FKC	All waters around Hokkaido.
Aomori	Nishi- Tsugaru	FKA	Tsugaru, up- and down-stream.
Nagasaki	Nagasaki	FKN	Tsushima, far upstream on East China Sea.
Saga	Karatsu	FKG	Tsushima, upstream on East China Sea.
Fukuoka	Fukuoka	FKF	Tsushima, immediately upstream and channel.
Yanaguchi	Nagato	FKY	Tsushima, channel and immediately down- stream on Sea of Japan.
Shinane	Hamada	FKS	Tsushima, far downstream.

(CONTINUED)

TABLE A3-2: Chronology of JMA data reports on
serial observations.

"Results of Marine Meteorological and Oceanographical
Observations"

VOLUME No.	DATA YEAR	REPORT YEAR
12	1950 - 55	1955
13	1950 - 53	1955
14	1954	1955
15	1954	1956
16	1955	1956
17	1955	1957
18	1955	1957
19	1956	1957
20	1956	1958
21	1957	1958
22	1957	1959
23	1958	1959
24	1958	1960
25	1959	1960
26	1959	1961
27	1960	1961
28	1960	1962
29	1961	1962
30	1961	1963
31	1962	1963
32	1962	1964
33	1963	1964
34	1963	1965
35	1964	1965
36	1964	1966
37	1965	1966
38	1965	1967
39	1966	1967
40	1966	1968

TABLE A3-2: Chronology of JMA data reports on
serial observations (Cont'd).

"Results of Marine Meteorological and Oceanographical
Observations"

VOLUME No.	DATA YEAR	REPORT YEAR
41	1967	1968
42	1967	1969
43	1968	1969
44	1968	1970
45	1969	1970
46	1969	1971
47	1970	1971
48	1970	1972
49	1971	1972
50	1971	1973
51	1972	1973
52	1972	1974
53	1973	1974
54	1973	1975
55	1974	1975
56	1974	1976
57	1975	1977
58	1975	1977

Table A3-3 lists formats and notations employed in the data tables of this report.

In the United States, both the Scripps Institution of Oceanography at La Jolla, California, and the Woodshole Oceanographic Institution at Woodshole, Massachusetts, hold a complete set of the JHO data reports in their libraries.

Inquiries on detailed information on the JHO data may be directed to:

JAPAN OCEANOGRAPHIC DATA CENTER
Hydrographic Office (Suiro-bu)
Maritime Safety Agency (Kaijo Hoancho)
3-1 5-Chome, Tsukiji, Chuo-ku
Tokyo 104, Japan

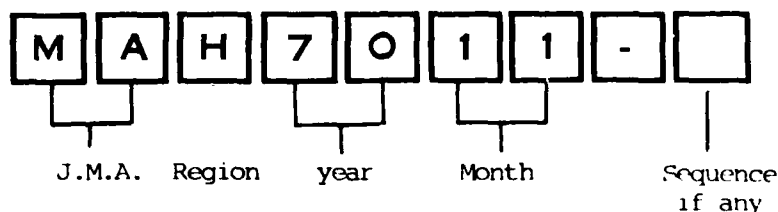
Telephone Tokyo (03) 541-3811
Telex Tokyo (03) 252-2452
Telefax Tokyo (03) 545-2885

Data Search

Since the ship's name is synonymous with a respective agency and since each cruise chart lists the three-month period and the year in which the cruise took place, one can immediately proceed to identify the corresponding data report by consulting the data report listing in Table A3-2.

For instance, in the cruise track chart for Oct-Dec, 1970, Kofu Maru conducted a cruise west of the Tsugaru Strait in obviously a multi-ship operation along with Ryofu Maru, Shumpu Maru, Chofu Maru and Seifu Maru. This cruise was part of the comprehensive study of the Sea of Japan during 1968-1970 in a joint program among the JHO, the JFA and the JMA. By consulting the data reports listed in Table A3-2, the data for the Kofu Maru cruise, which took place during the second six-month period of the year, should be found in the second issue of the data reports for 1970, i.e., in Volume 48, published in 1972. The cruise track also indicates the table numbers for the cruise (9, 25, 39, 42) which, respectively, corresponds to the table numbers for the serial, BT, GEK and plankton data in the data report.

The cruise information in the NAVOCEANO OERS cruise inventory data base can be accessed through the cruise number which, in the case of JMA data, is organized as follows:



The first three characters denote the agency (Hakodate M.M.O., see Table A3-1). The four ensuing digits consist of the first two denoting the year and the other two denoting the ending month of data collection. (Whenever repeat cruises are performed by the same agency during the same month of the year, a one-digit sequence code is added after a hyphen.)

Since the information in the cruise chart only indicates a three-month period in which the cruise took place, one will have to search the data by querying all three possible cruise codes for this period: MAH7010, MAH7011, and MAH7012. Once the Kofu Maru data is thus identified (MAH7011), one can readily locate the data for other ships in this multi-ship operation, using MAQ7011 (Ryofu Maru - JMA Headquarters), MAK7011 (Shumpu Maru - Kobe M.M.O.), MAN7011 (Chofu Maru - Nagasaki M.M.O.), and MAM7011 (Seifu Maru - Maizuru M.M.O.).

In the United States, both the Scripps Institution of Oceanography at La Jolla, California, and the Woodshole Oceanographic Institution at Woodshole, Massachusetts, hold a complete set of the JHO data reports in their libraries.

Inquiries on detailed information on the JHO data may be directed to:

JAPAN OCEANOGRAPHIC DATA CENTER
 Hydrographic Office (Suiro-bu)
 Maritime Safety Agency (Kaijo Hoancho)
 3-1 5-Chome, Tsukiji, Chuo-ku
 Tokyo 104, Japan
 Telephone Tokyo (03) 541-3811
 Telex Tokyo (03) 252-2452
 Telefax Tokyo (03) 545-2885

TABLE A3-3: Format and notations in the JMA data report:
"Results of Marine Meteorological and Oceanographic Observations"

I. Serial Oceanographic Observations

<i>Time</i>	: Japanese Standard Time.
<i>Depth to bottom</i>	: In meters.
<i>Color of the Sea</i>	: In Forel Scale.
<i>Transparency</i>	: In meters.
<i>Direction of the wind</i>	: In 36-point scale.
<i>(wind waves, swell)</i>	
<i>Wind velocity</i>	: In meter/sec.
<i>Wind waves</i>	: In the scale (0~9).
<i>Swell</i>	: In the scale (0~9).
<i>Air pressure</i>	: In 0.1 mb.
<i>Air temperature</i>	: In 0.1°C.
<i>Wet bulb temperature</i>	: In 0.1°C.
<i>Amount of clouds</i>	: In the scale (0~10).
<i>Visibility</i>	: In the scale (0~9).
<i>D</i>	: In meters determined by the wire length and angle. When the depth is measured by unprotected thermometer, the value is marked with an asterisk*.
<i>T</i>	: In 0.1 and 0.01°C.
<i>S</i>	: Salinity in ‰ determined by the method of electric conductivity measurement.
<i>O₂</i>	: Dissolved oxygen content in ml/l at NTP determined by the Winkler method.
<i>phos. P</i>	: Inorganic phosphate-phosphorus in µg-atoms/l determined by the reduction method, using ascorbic acid (STRICKLAND and PARSONS, 1965).
<i>sil. Si</i>	: Inorganic silicate-silicon in µg-atoms/l determined by the Diëbert Wanderbulcke method.
<i>NO₃-N</i>	: Nitrate-nitrogen, in µg-atoms/l determined by the Müllin-Riley reduction method, using Cd Cu column (WOOD, ARMSTRONG and RICHARDS, 1967).

(TO CONTINUE)

TABLE A3-3: Format and notations in the JMA data report:
(Cont'd) "Results of Marine Meteorological and Oceanographical Observations"

NO_2-N	: Nitrite-nitrogen in $\mu g\text{-atoms/l}$ determined by Griess reaction (STRICKLAND and PARSONS, 1965).
NH_4-N	: Ammonia-nitrogen in $\mu g\text{-atoms/l}$ determined by the modified indophenol method.
ΣP	: Total phosphorus of unfiltered water in $\mu g\text{-atoms/l}$ determined by the potassium persulfate decomposition method.
pH_d	: Hydrogen ion concentration <i>in situ</i> in pH unit determined using the glass electrode pH meter.
$Chl. a$	: Chlorophyll a in $\mu g/l$ determined by the fluorometric technique.
$Phaeo.$	: Phaeopigments in $\mu g/l$ determined by the fluorometric technique.
$\Delta\sigma_t$	: $\Delta\sigma_t = 0.02736 - \frac{\sigma_t \cdot 10^{-3}}{1 + \sigma_t \cdot 10^{-3}}$
ΔD	: Anomaly of dynamic depth in dyn. m.

In the interpolated column, when a value is calculated by extrapolation, the value is bracketed.

The head of each of Oceanographic Observations are in the order as follows:

St. Ry-2269 station number	35-19N latitude	143-58E longitude
Feb. 25, 1725-1820 date and time (serial oceanographic observations)	1800 depth to bottom	5 color of the sea
17 (10) transparency (angle)	1800 time (marine meteorological observations)	
14-15.7 direction and velocity of the wind	14-5 direction and scale of the wind waves	
34-3 direction and scale of the swell	1027.4 air pressure	
14.3 air temperature	11.6 wet-bulb temperature	cloudy weather
10 amount of clouds	Ac - Cu type of clouds	8 visibility

(TO CONTINUE)

TABLE A3-3: Format and notations in the JMA data report:
(Cont'd) "Results of Marine Meteorological and Oceanographical Observations"

II. Bathythermograph Observations

Time : Japanese Standard Time.

SFC-S : Surface salinity in ‰.

In the remarks column, G shows the station with GEK observations and S shows the station with serial observations.

III. Current Observations

1. Geomagnetic Electro-Kinetograph

Time : Japanese Standard Time.

Dir : Direction in 36-point scale. 36 → N.

Vel : Velocity in knot.

SFC-T : Surface water temperature in °C.

In the remarks column, B shows the station with BT observations and S shows the station with serial observations.

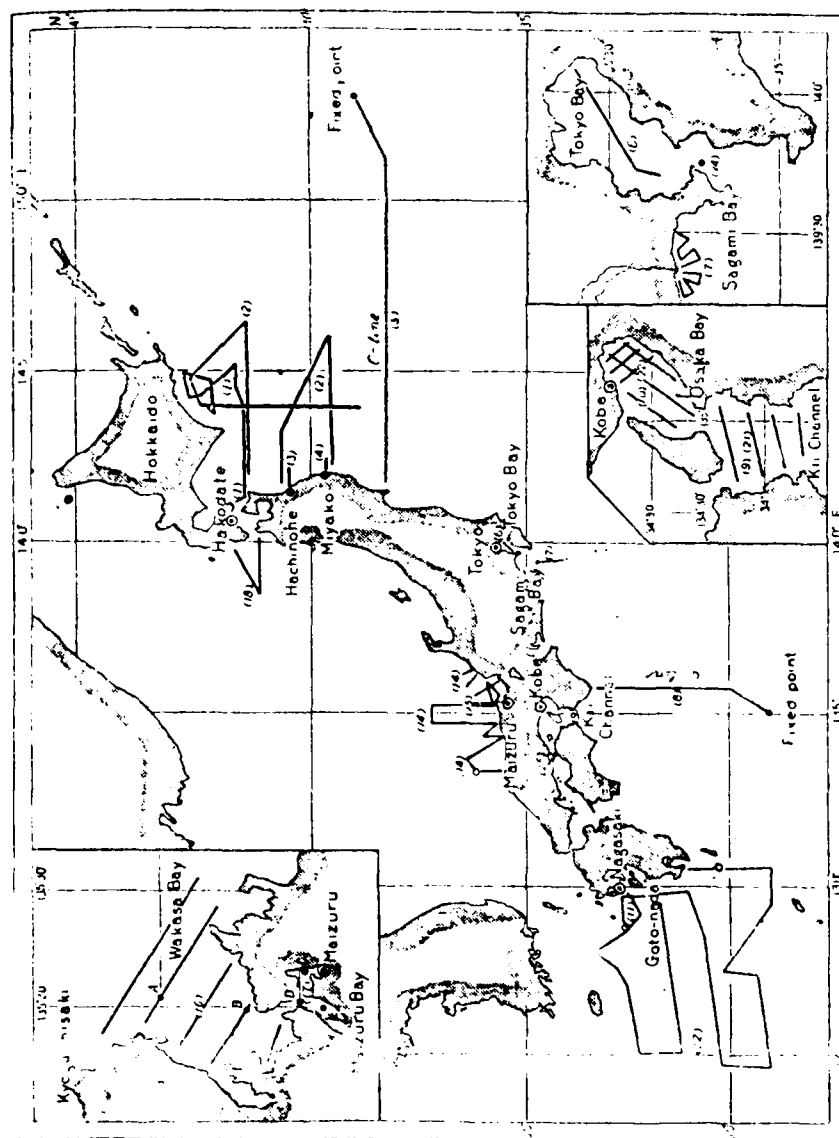
2. Ekman or TS-II Current Meter

Time : Japanese Standard Time.

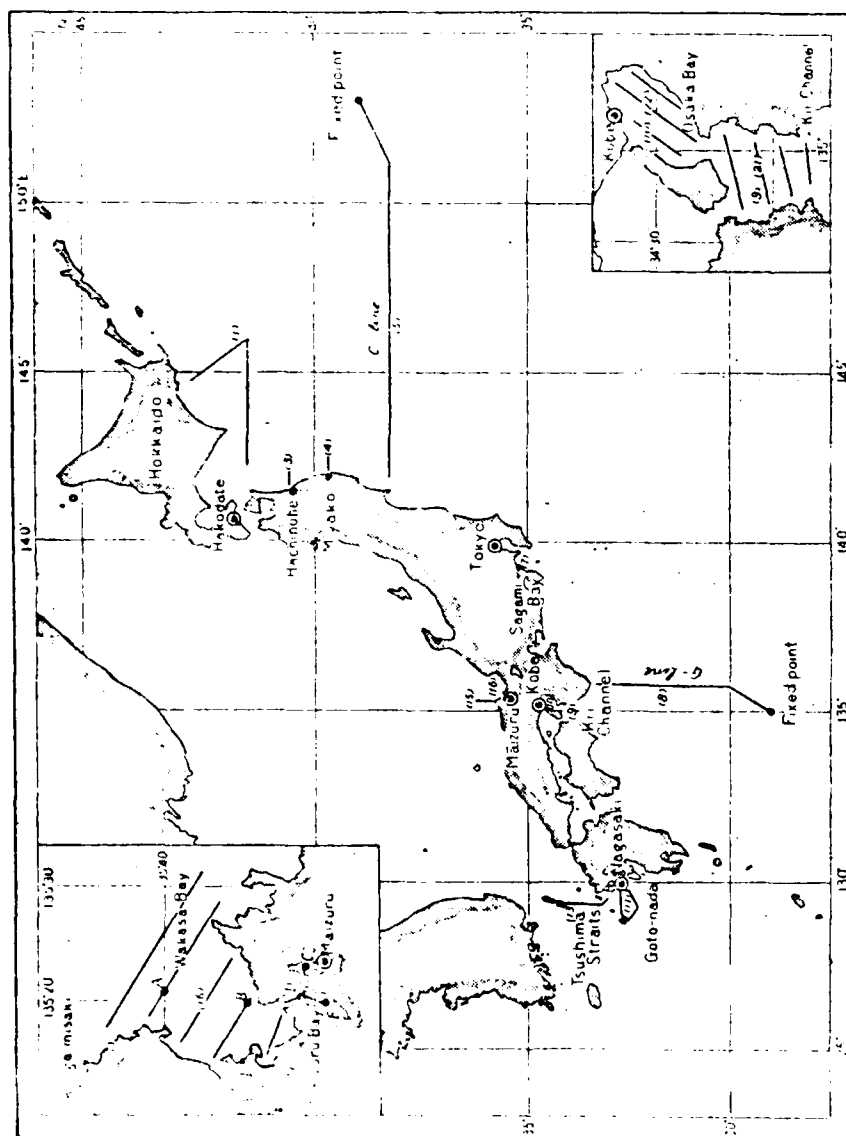
Dep : Depth in meter.

Dir : Direction in 360-point scale. 360 → N.

Vel : cm/sec.

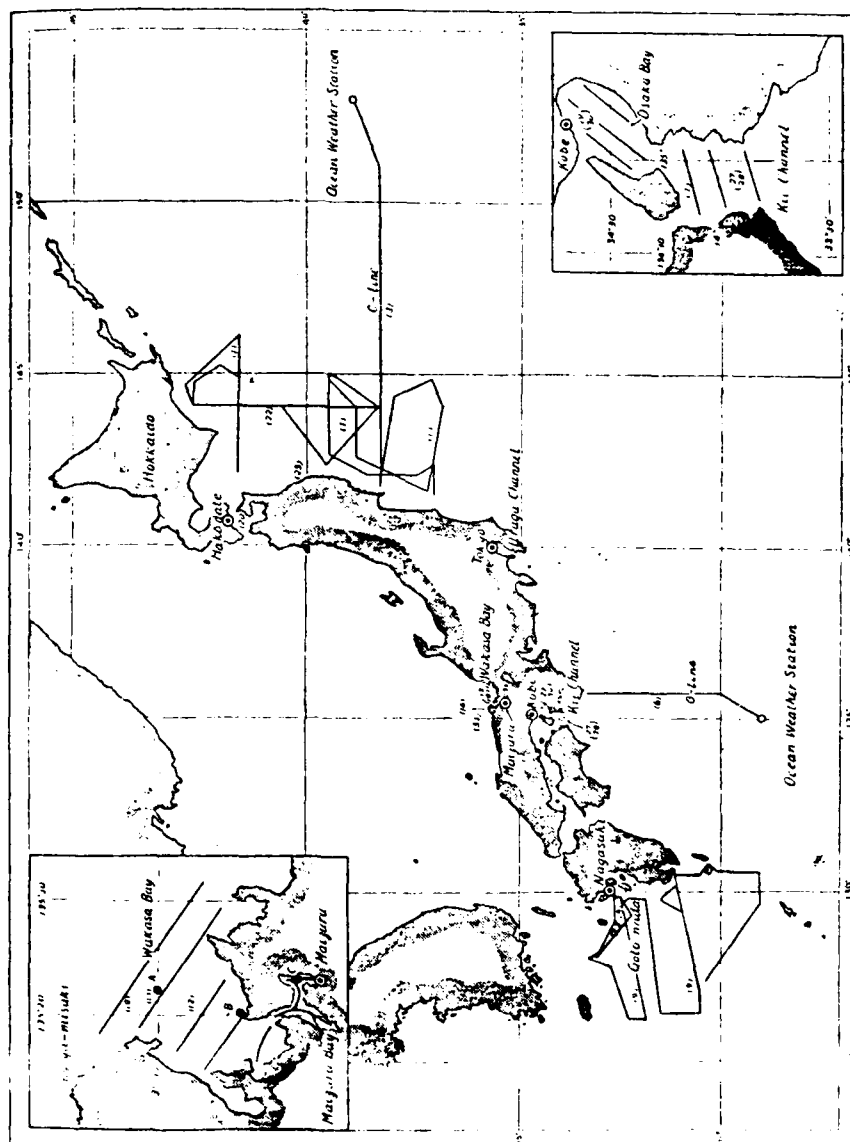


1. Map showing Oceanographical Stations and Sections. (July-September, 1952)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

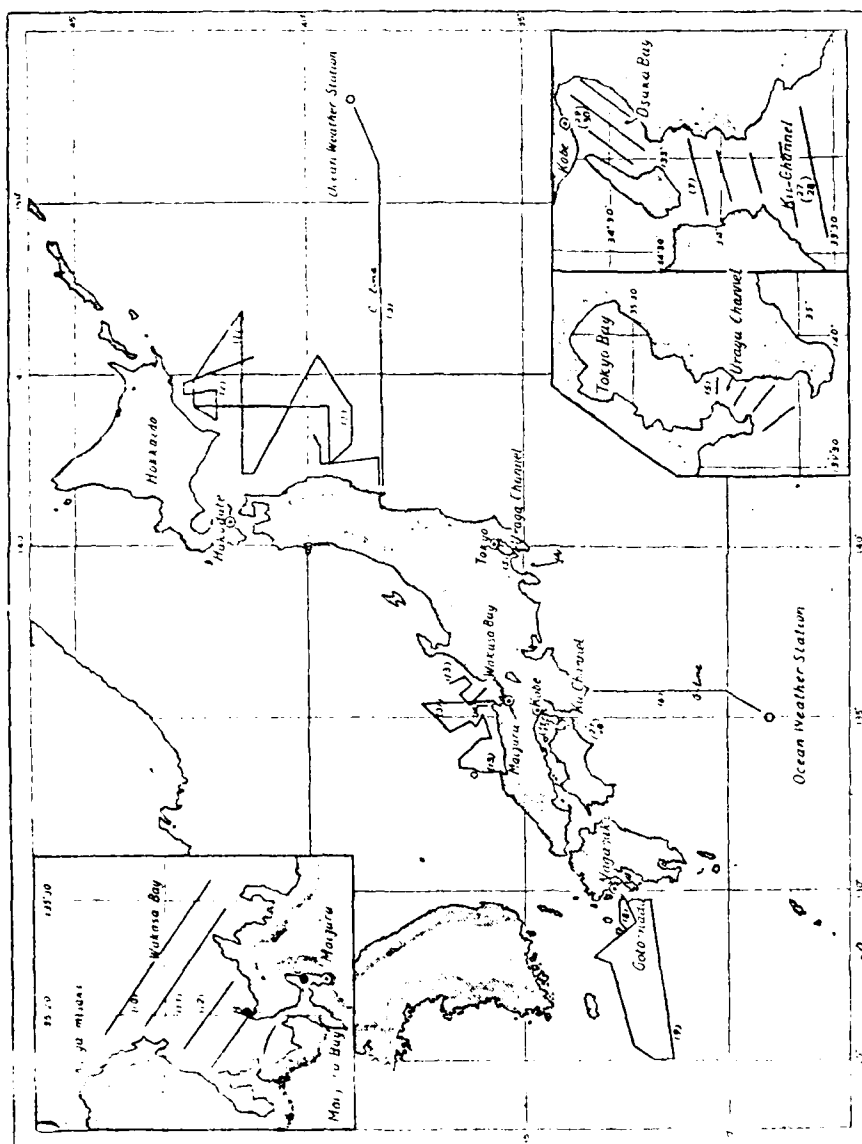


2. Map showing Oceanographical Stations and Sections. (October-December, 1952)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1952

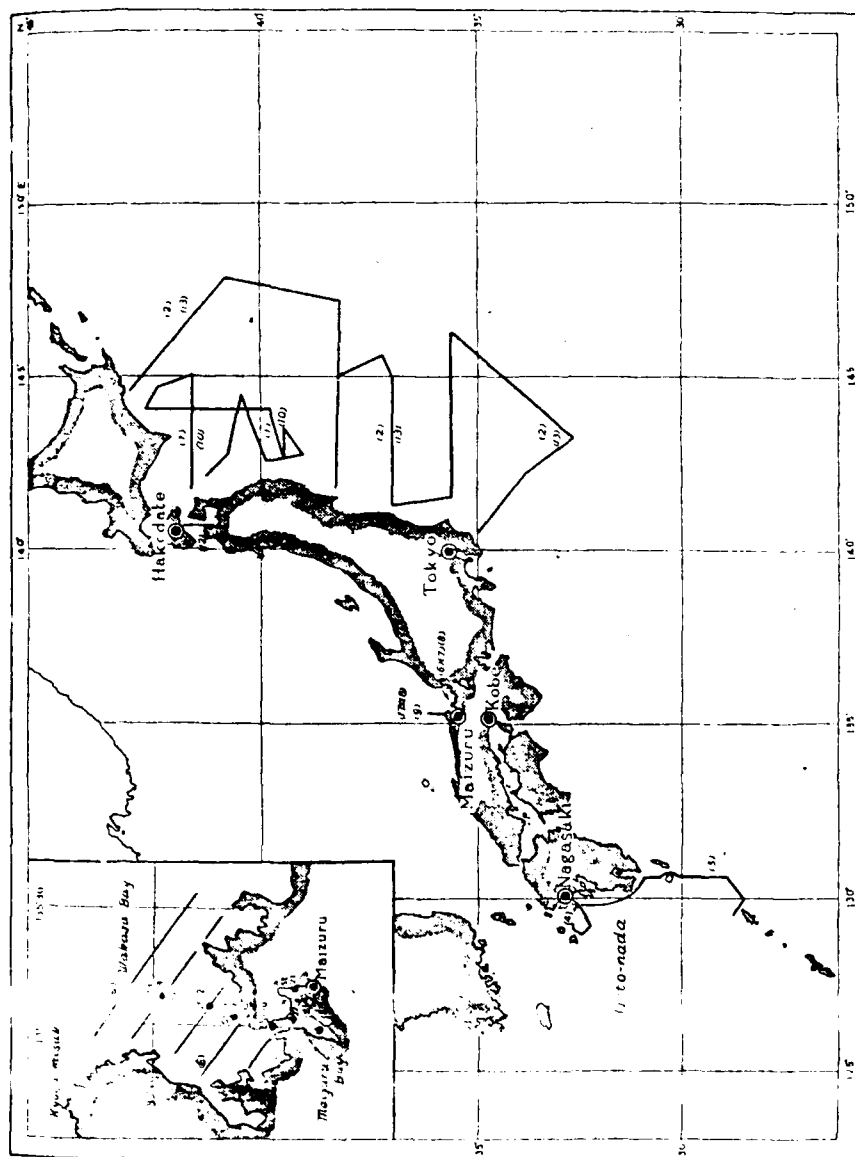


1. Map showing Oceanographical Stations and Sections. (January-June, 1953)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

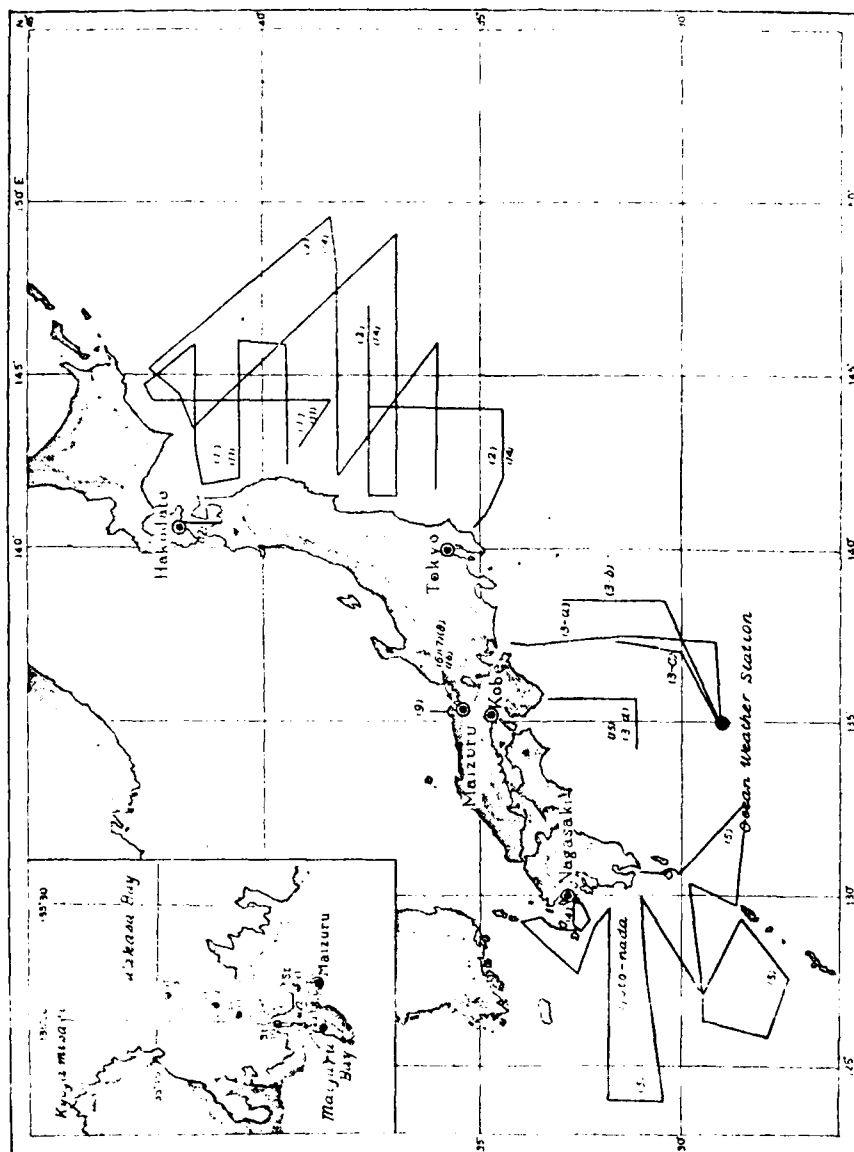


2. Map showing Oceanographical Stations and Sections. (July-December, 1953)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1953

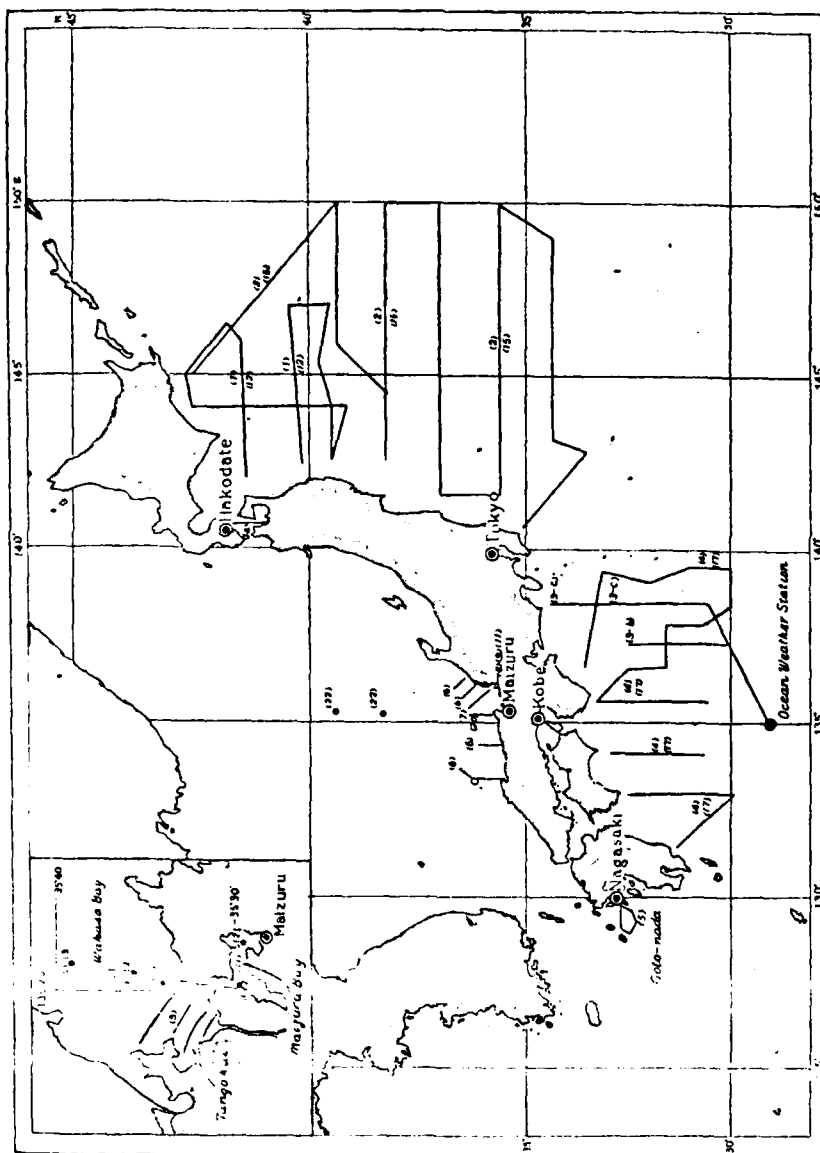


1. Map showing Oceanographical Stations and Sections. (January-March, 1954)
The numeral in parentheses indicates the number of the table containing the data taken at that point. Small letters in the parentheses indicate the distinction of research ships.



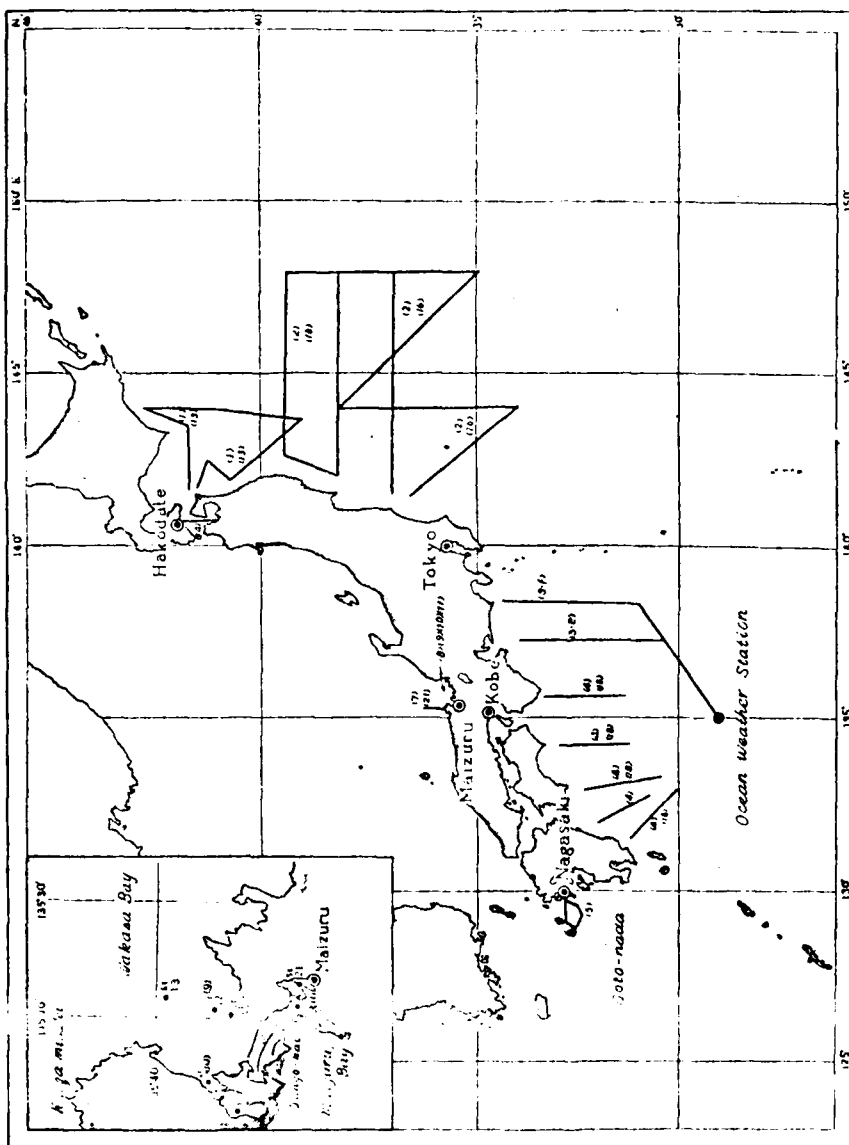
2. Map showing Oceanographical Stations and Sections (April-June, 1954)
The numeral in parentheses indicates the number of the table containing the
date taken at that point. Small letters in the parentheses indicate the
distinction of research ships.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1954



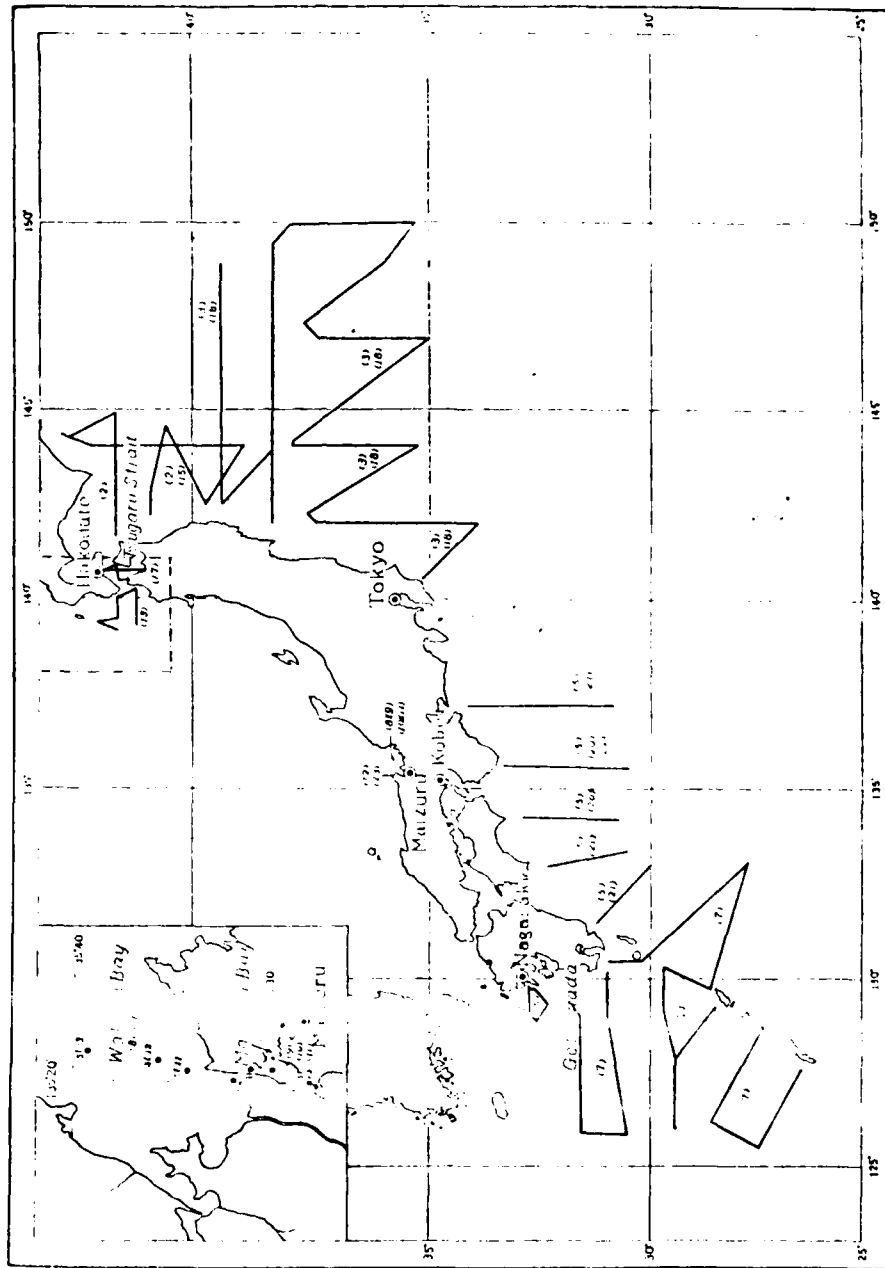
1. Map showing Oceanographical Stations and Sections. (July-September, 1954)
The numeral in parentheses indicates the number of the table containing the data taken at that point. Small letters in the parentheses indicate the distinction of research ships.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1954

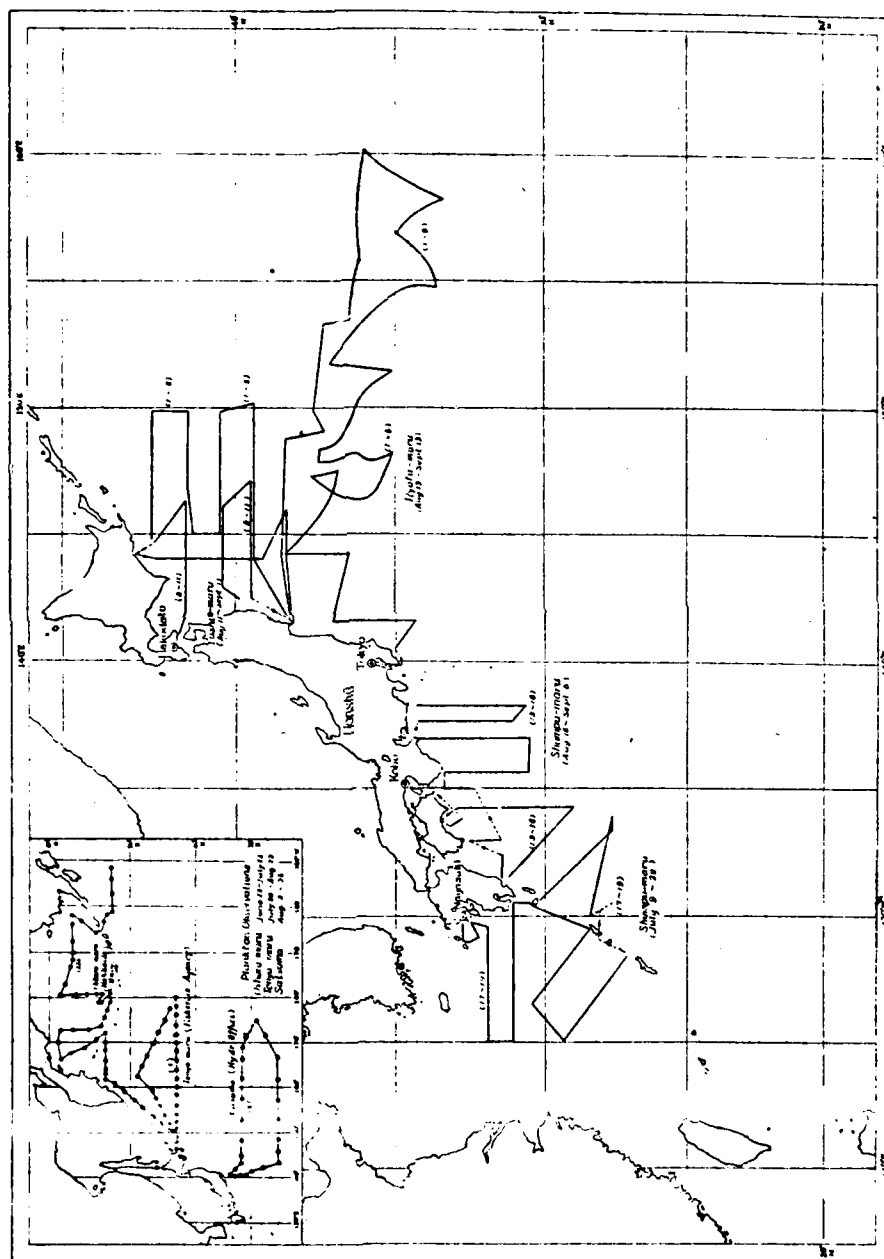


2. Map showing Oceanographical Stations and Sections (October-December, 1954). The numeral in parentheses indicates the number of the table containing the date taken at that point. Small letters in the parentheses indicate the distinction of research ships.

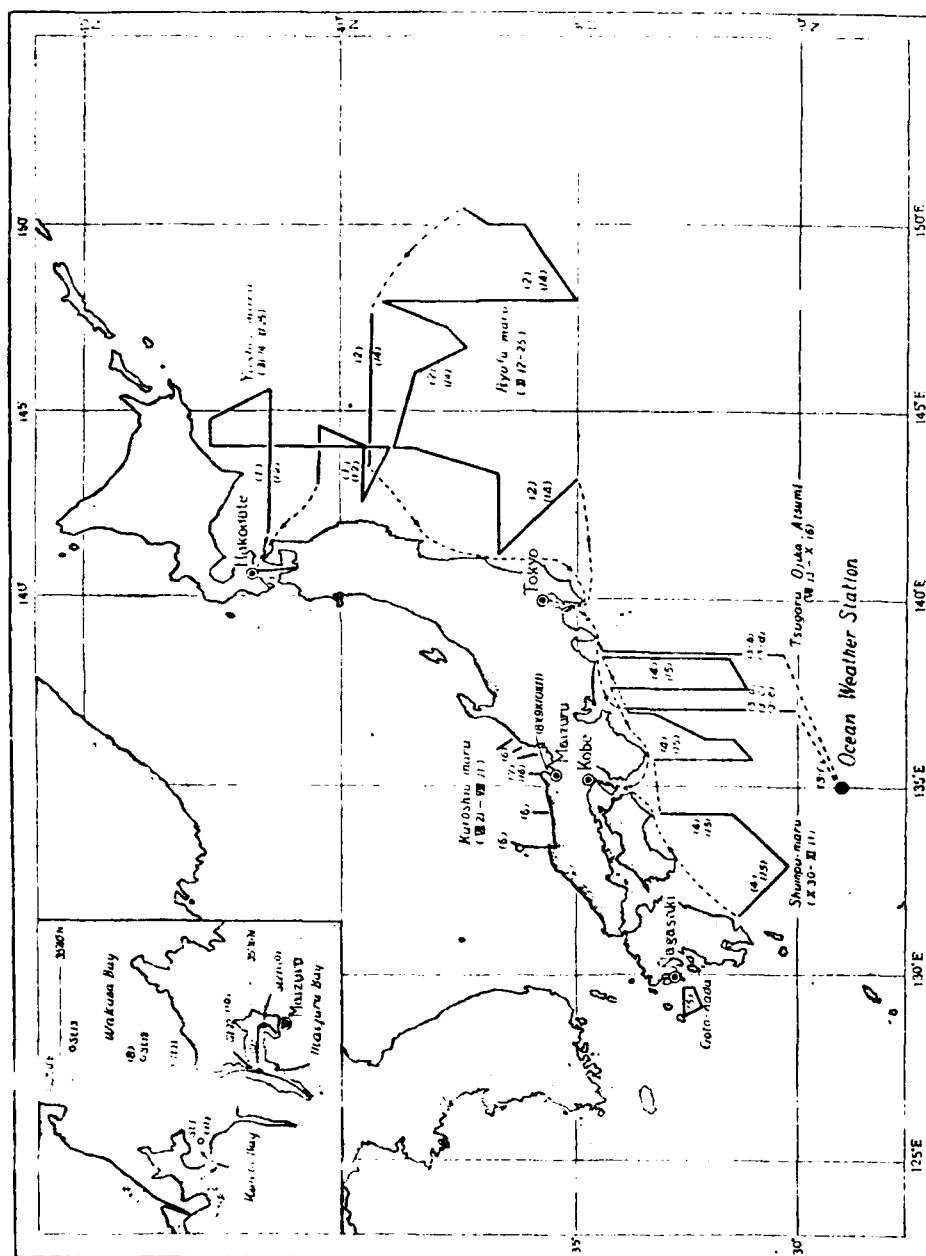
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1954



1 Map showing Oceanographical Stations and Sections (January-March, 1955)
 The numeral in parentheses indicates the number of the table containing the data
 taken at that point.
 N. B. : Heavy line in the area circled with semi-dotted line (— · — · — ·)
 indicate the observational lines taken in 1953.

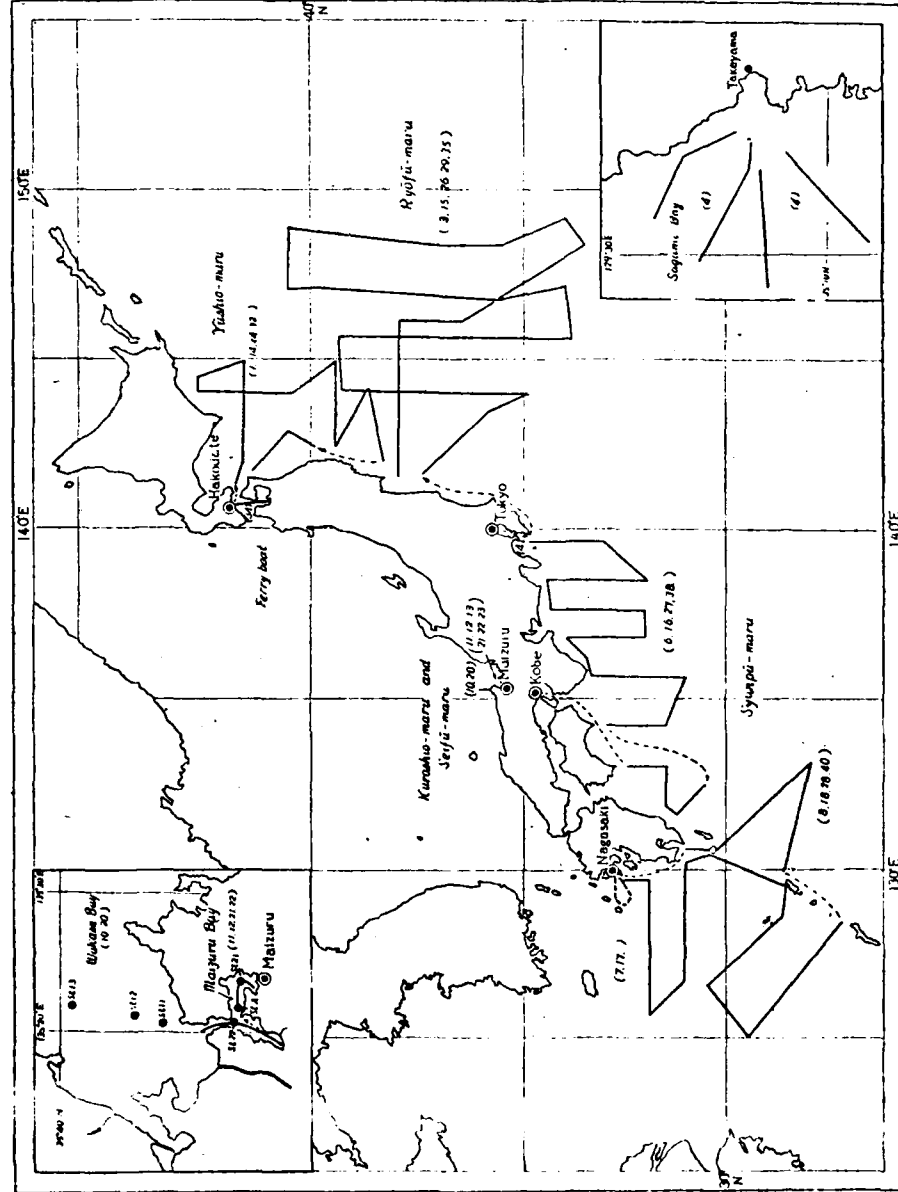


Map showing oceanographic stations. (July-Sept., 1955)
The numerals in parentheses indicate the number of the
table containing the data taken along that line.

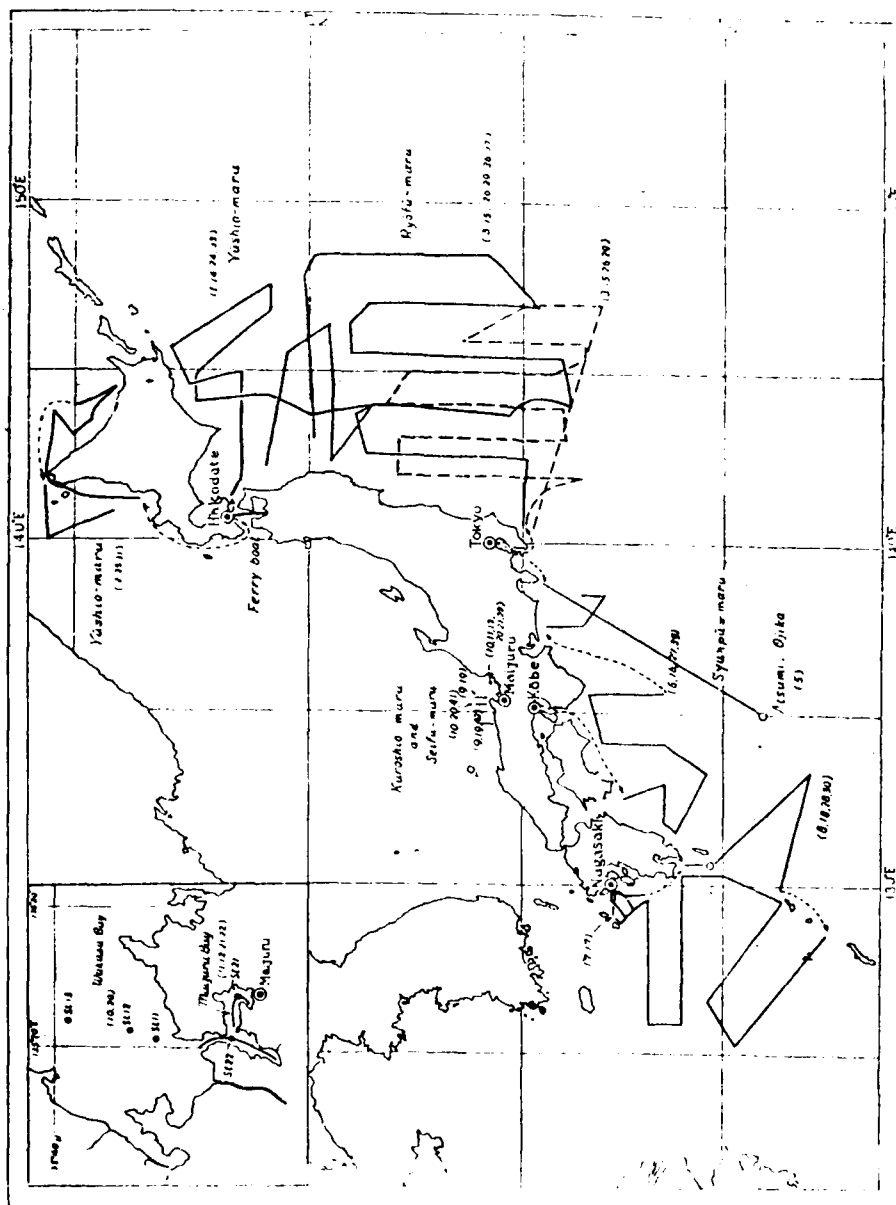


Map showing Oceanographical Stations and Sections. (July-December, 1955)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

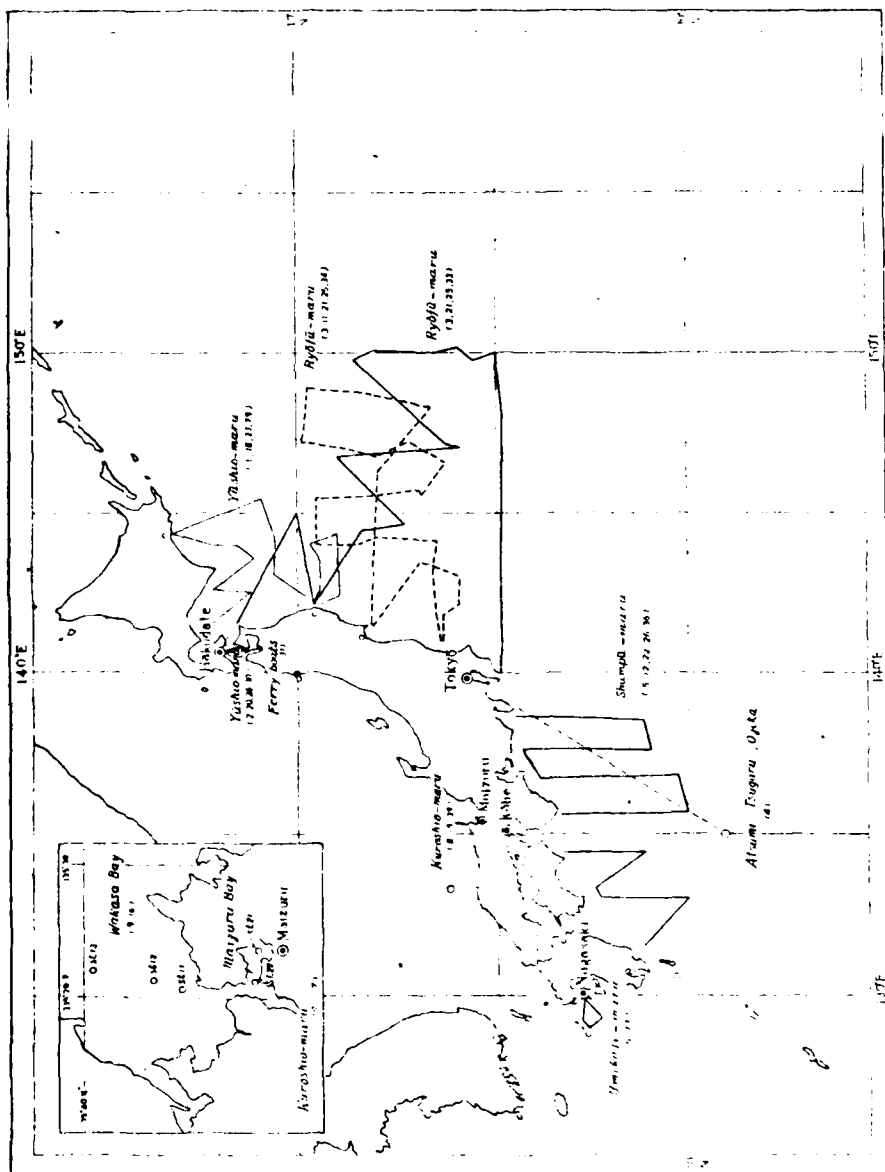
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1955



Map showing Oceanographical Stations and Sections (Jan. - Mar. 1956).
The numeral in parentheses indicates the number of the table containing the data taken at that point.

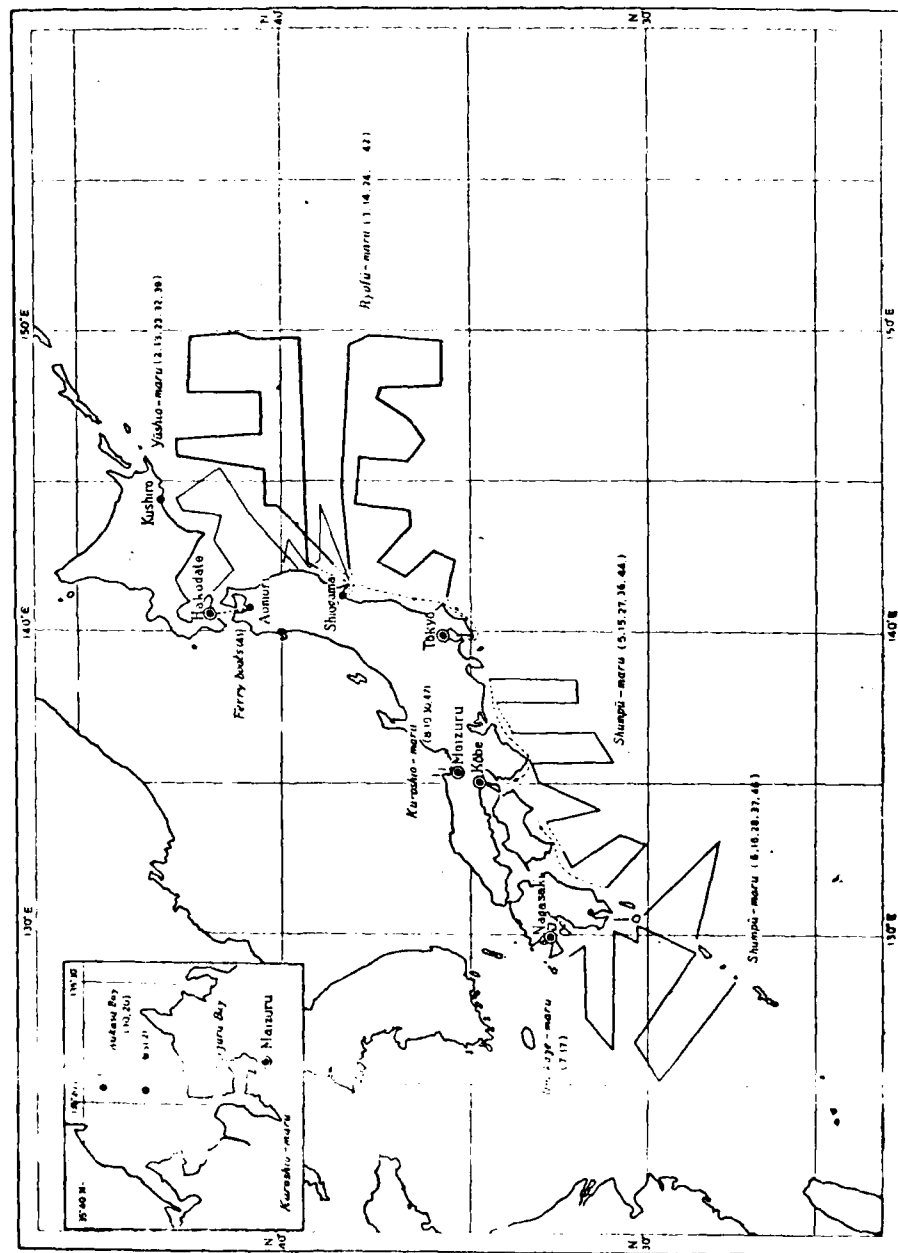


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1956

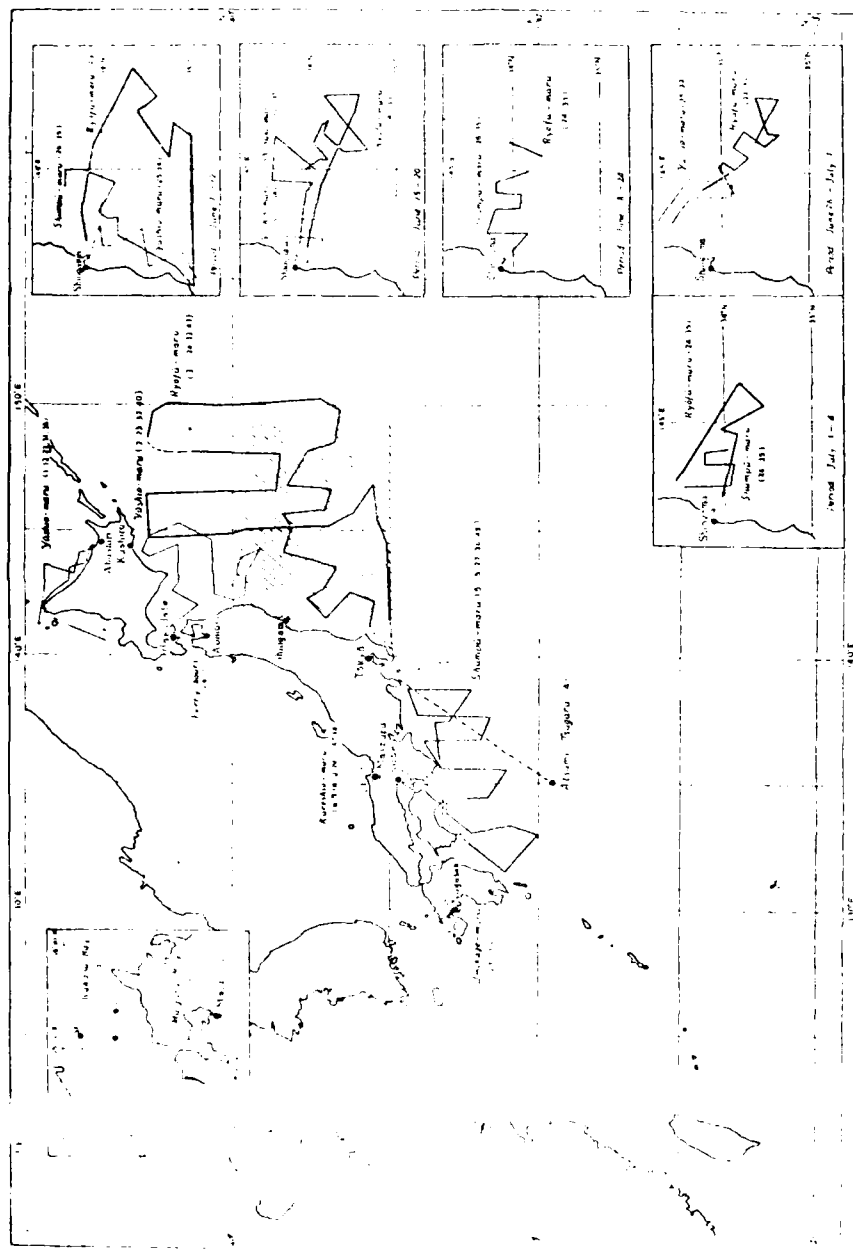


Map showing Oceanographical Stations and Sections. (Sept. Dec. 1956). The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1956

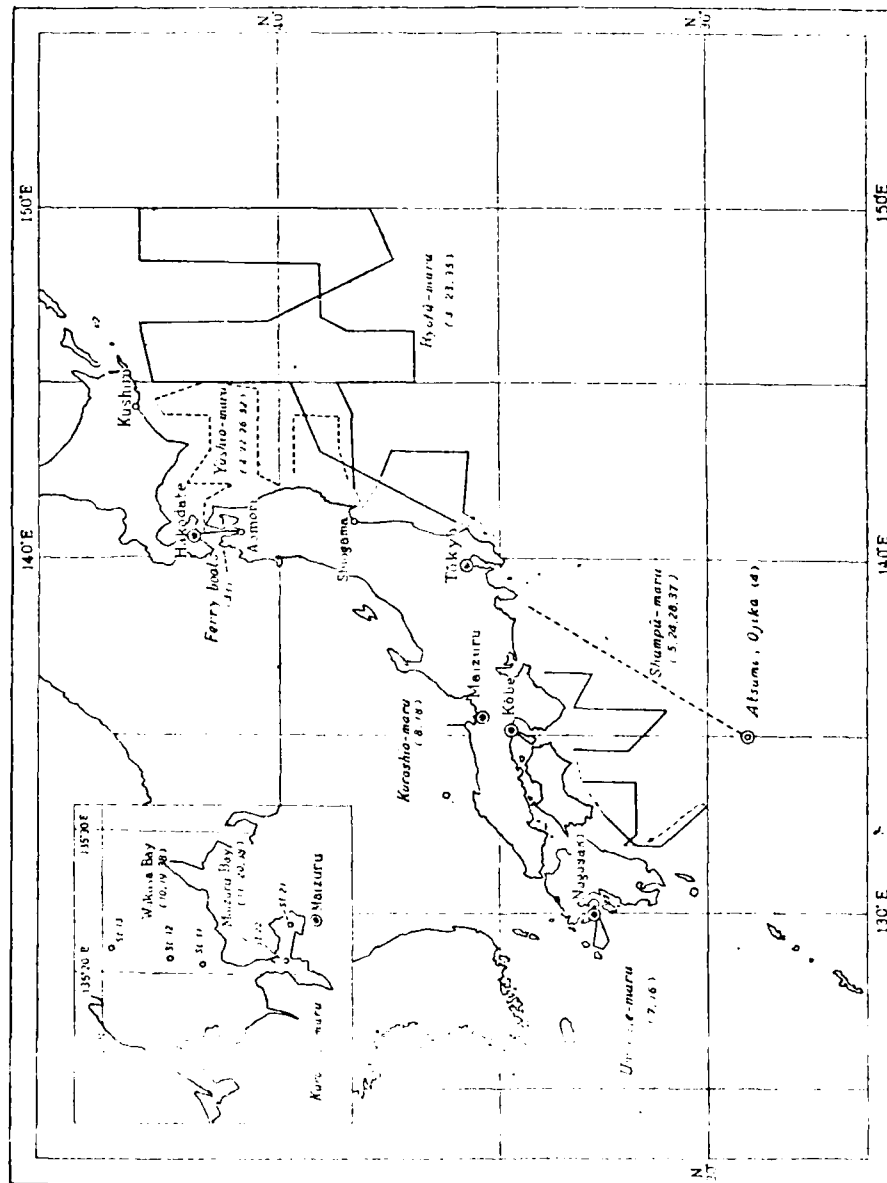


Map showing Oceanographic Stations and Sections. (Jan. ~ Mar. 1957).
 The numeral in parentheses indicates the number of the table containing the data taken at that point.



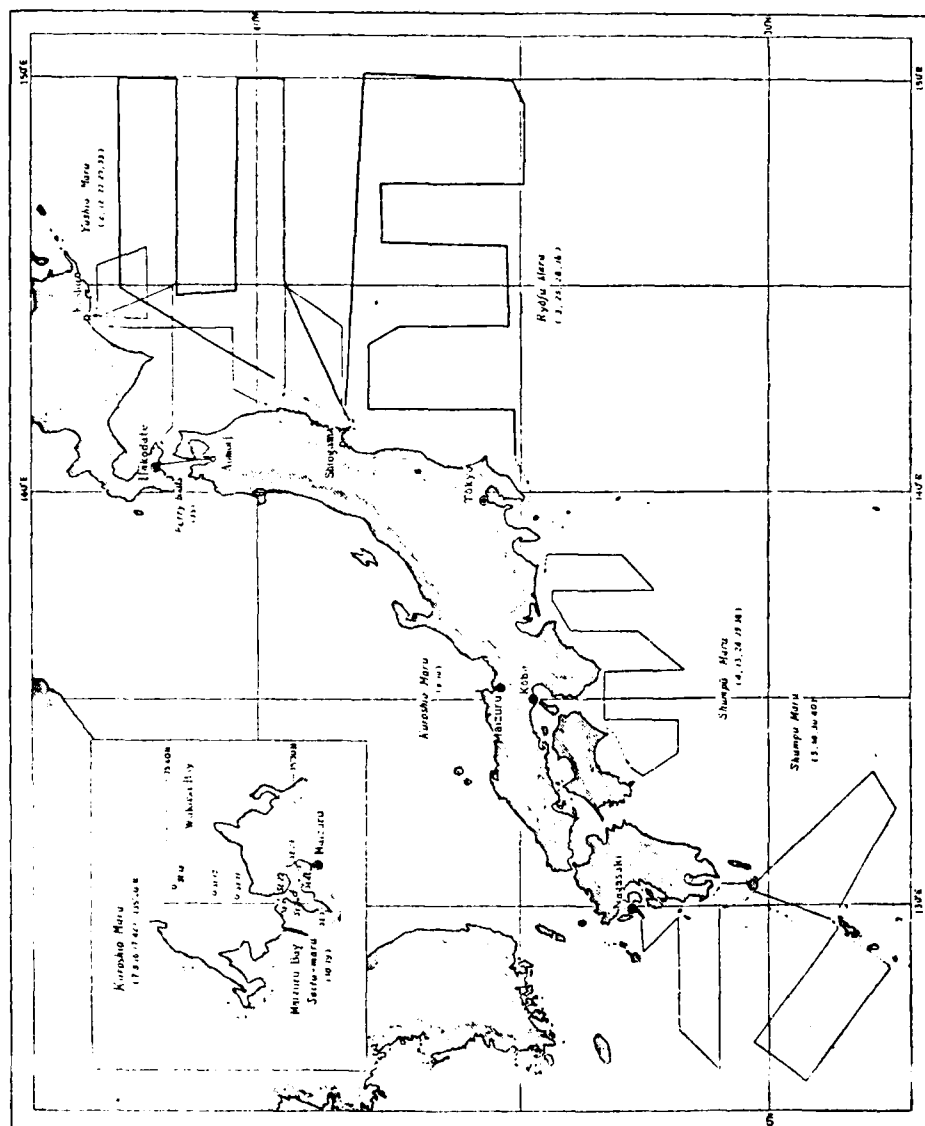
Map showing Oceanographic Stations and Sections. (Apr ~ June 1957).
 The numeral in parentheses indicates the number of the table containing the data taken at that point.
 The shaded shows the observed area of the multiple current measurements in the I.G.Y.
 Details are shown in attached figures.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1957

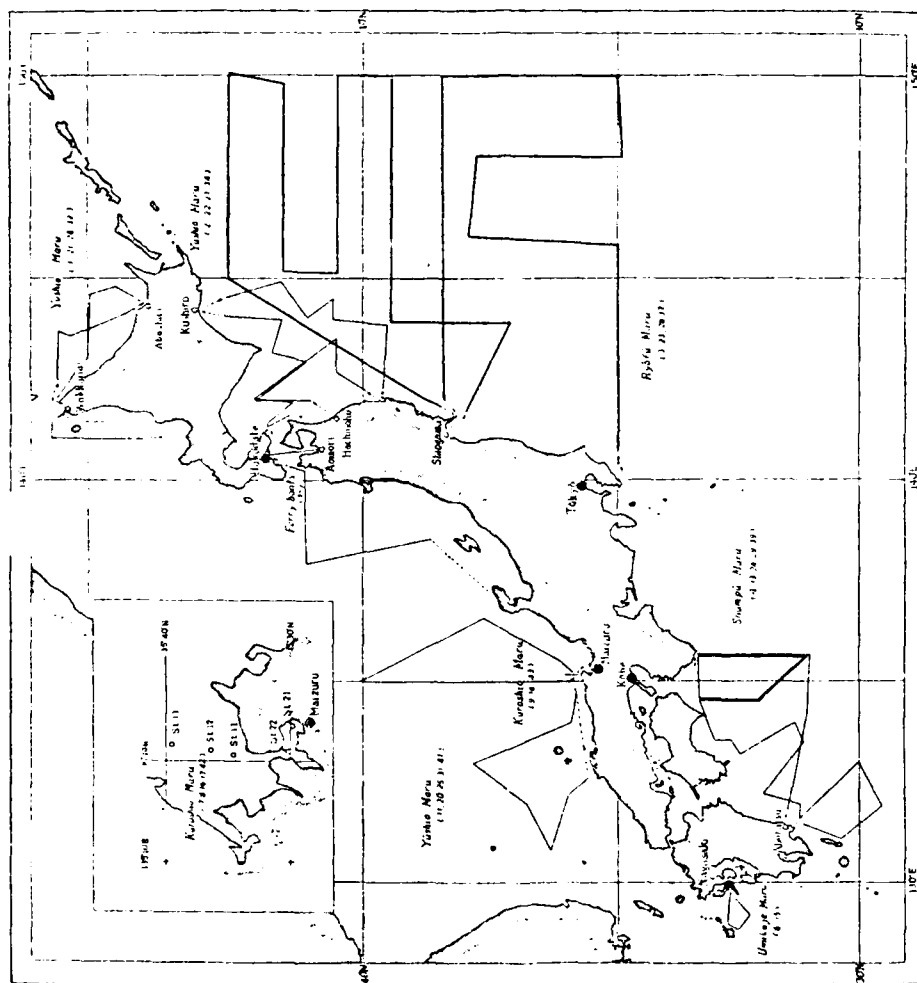


Map showing Oceanographic Stations and Sections, (Oct.~Dec. 1957).
The numeral in parentheses indicates the number of the table containing the data taken at that point.

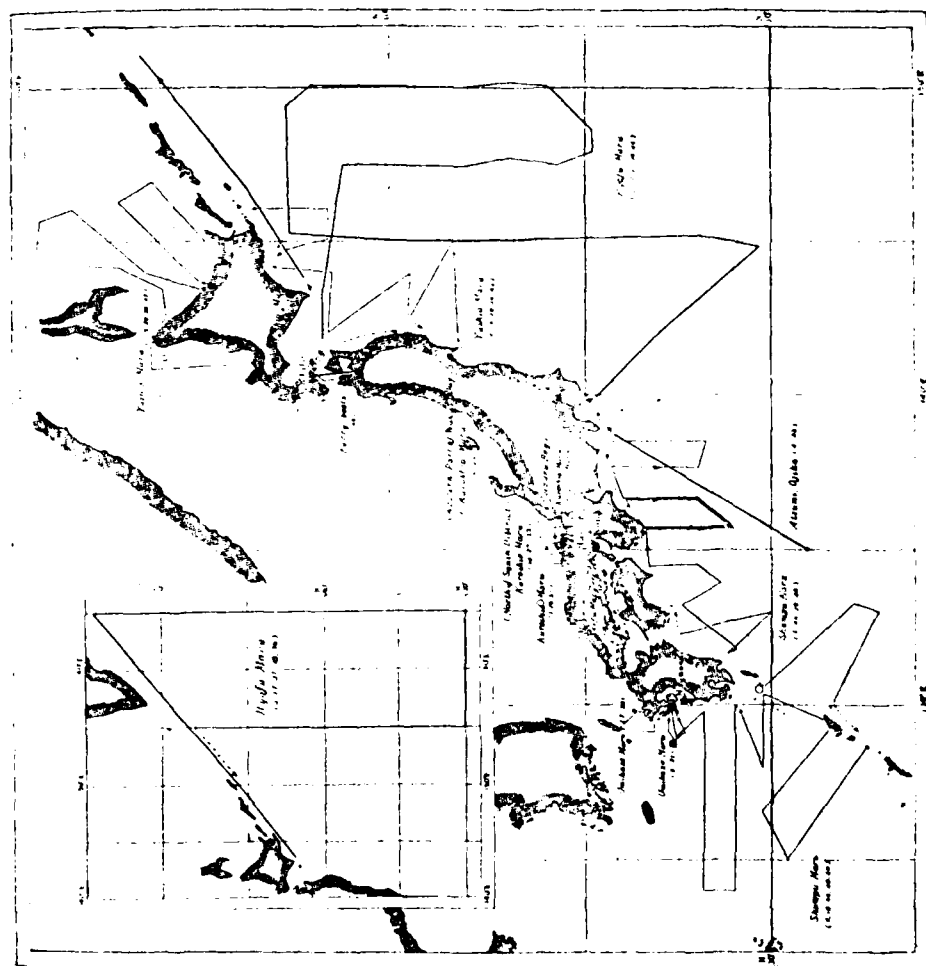
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1957



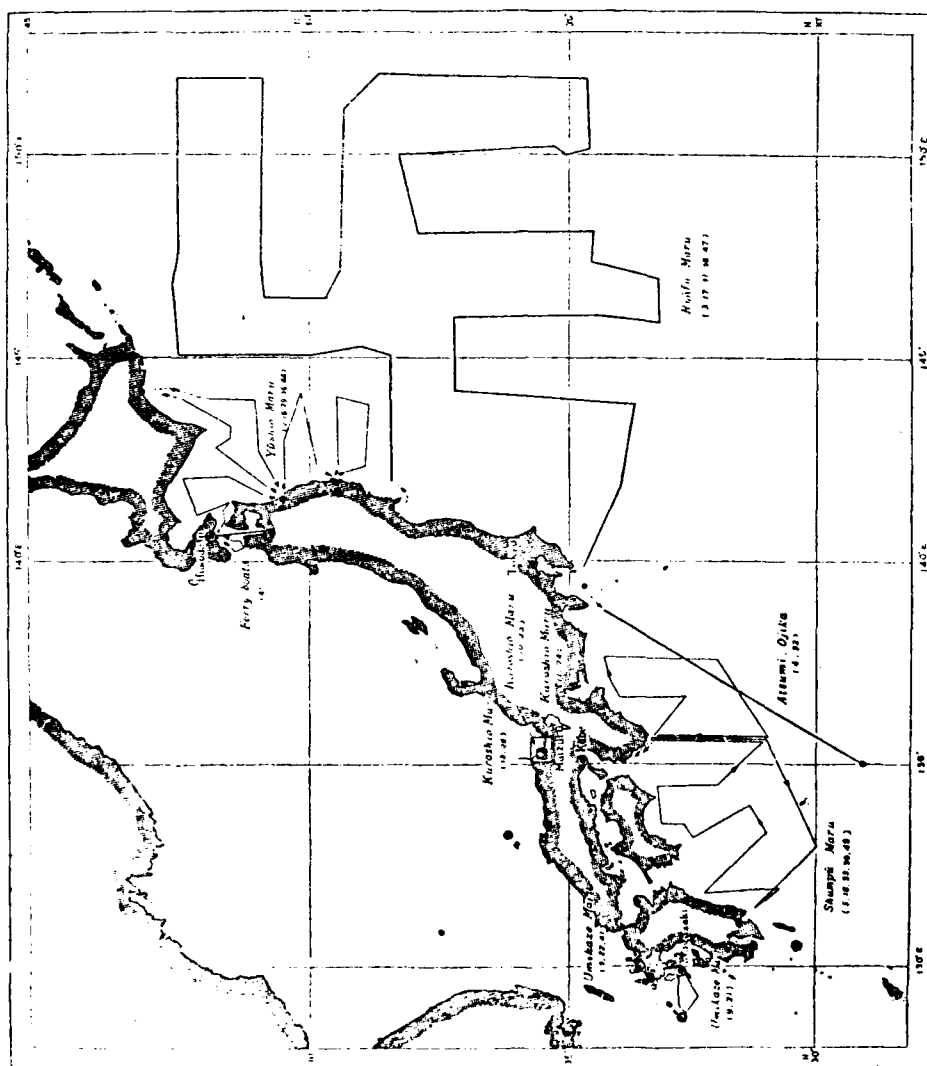
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1958



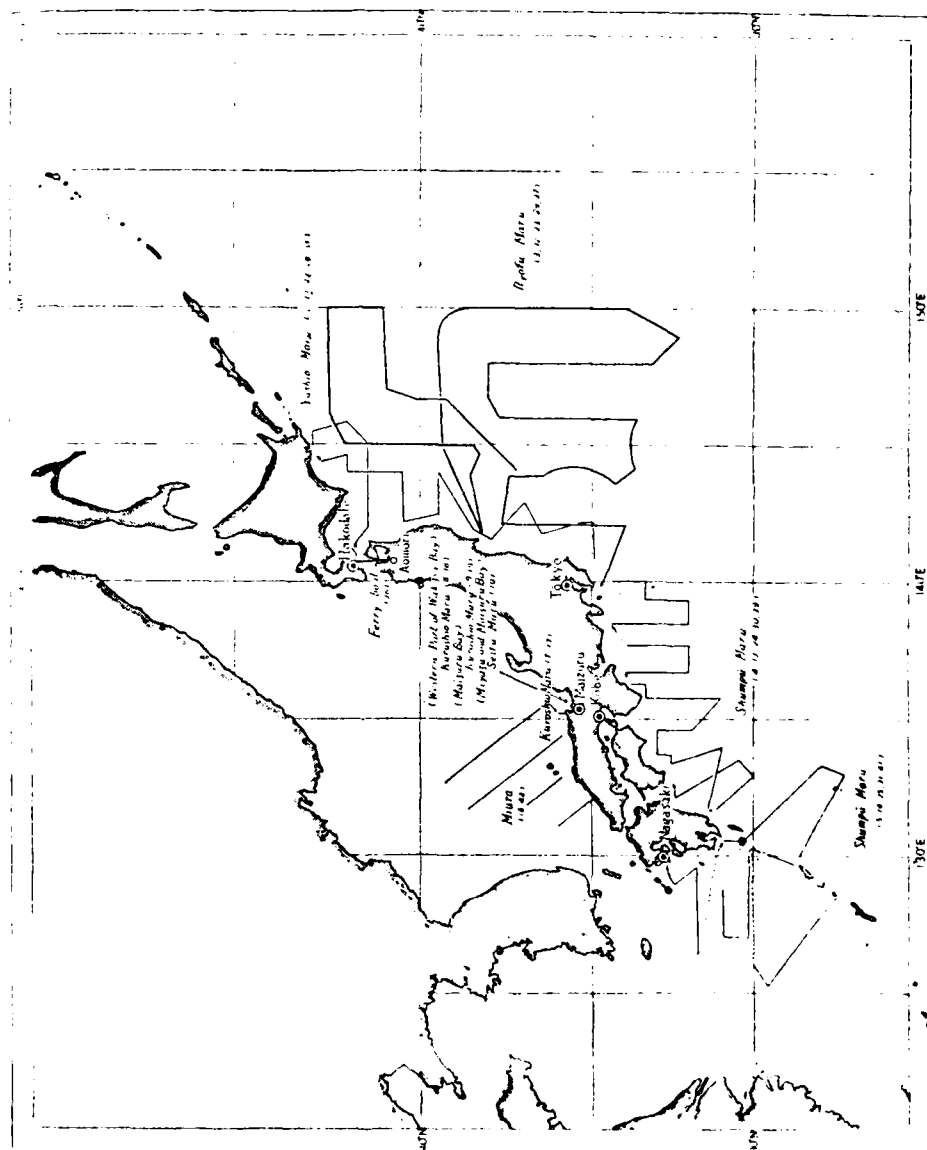
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1958



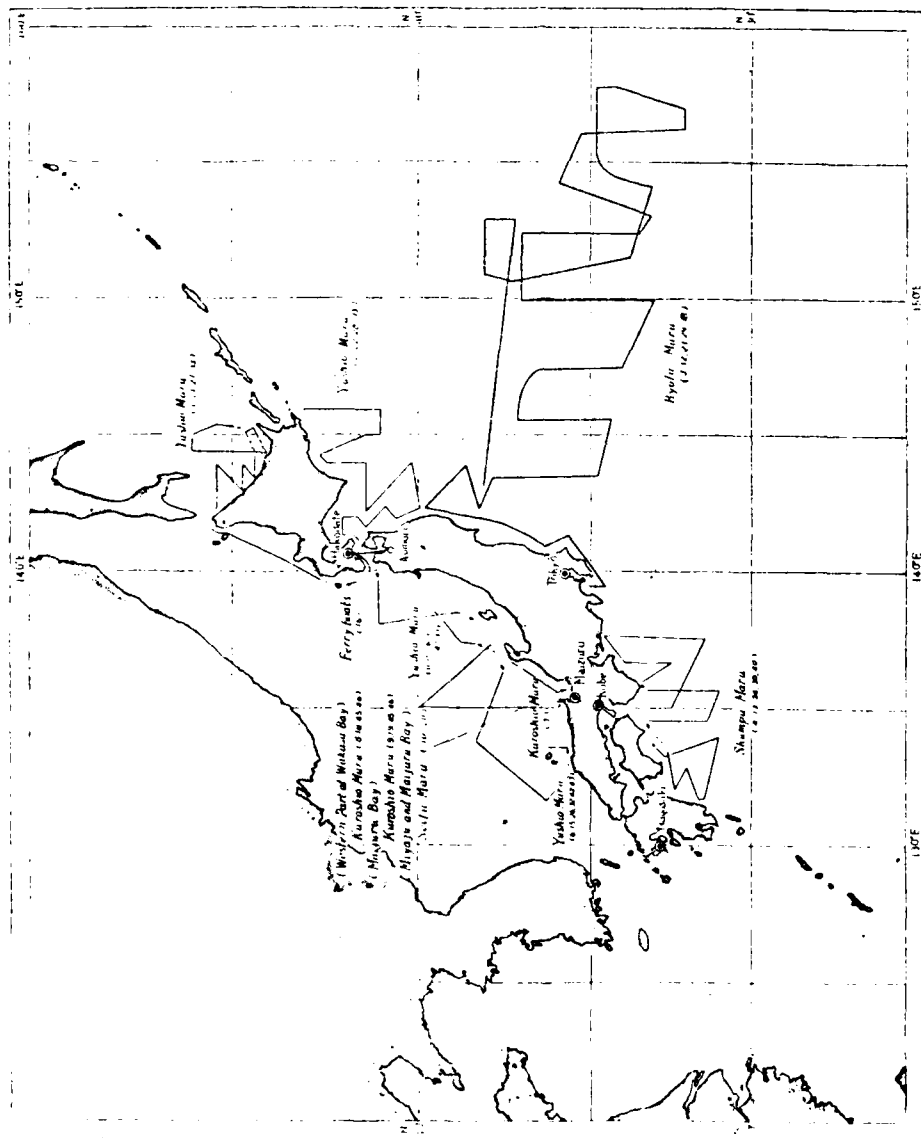
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1958



CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1958

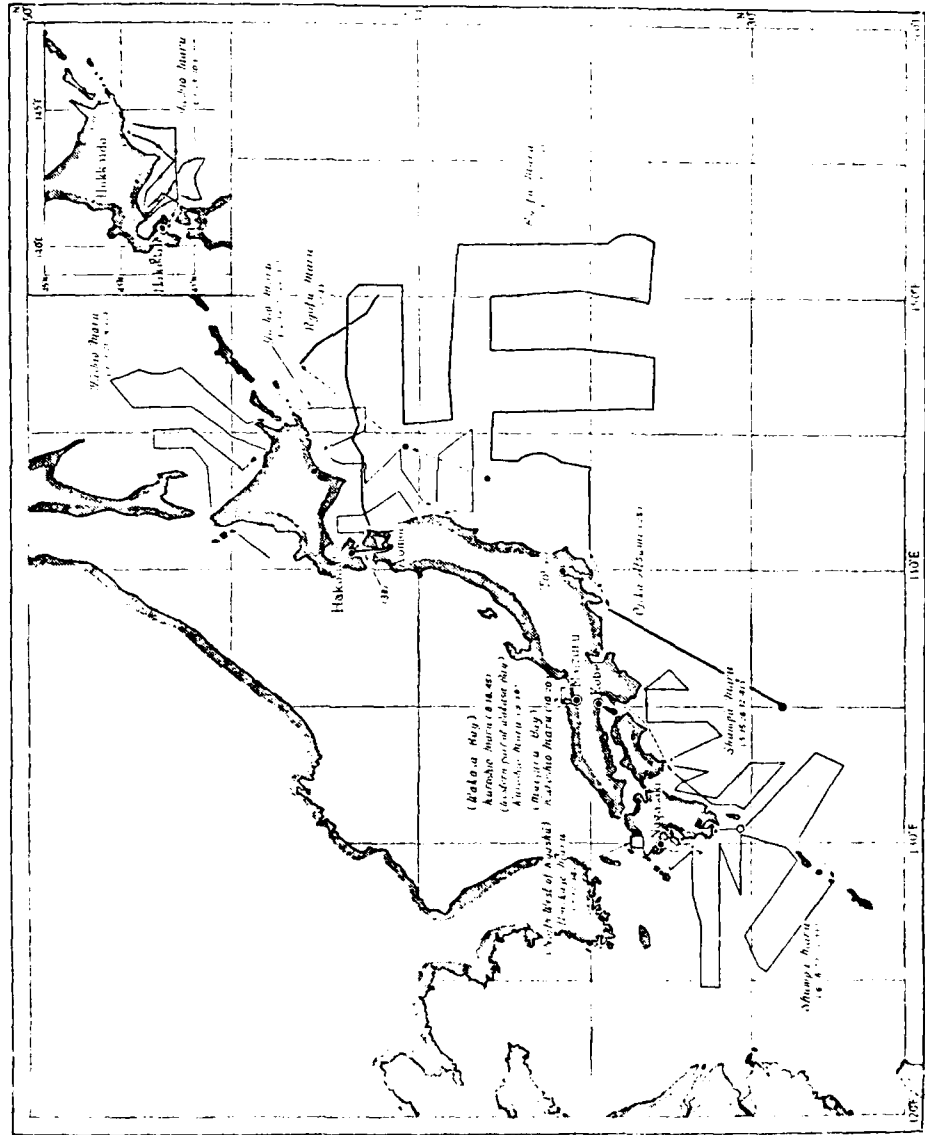


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1959

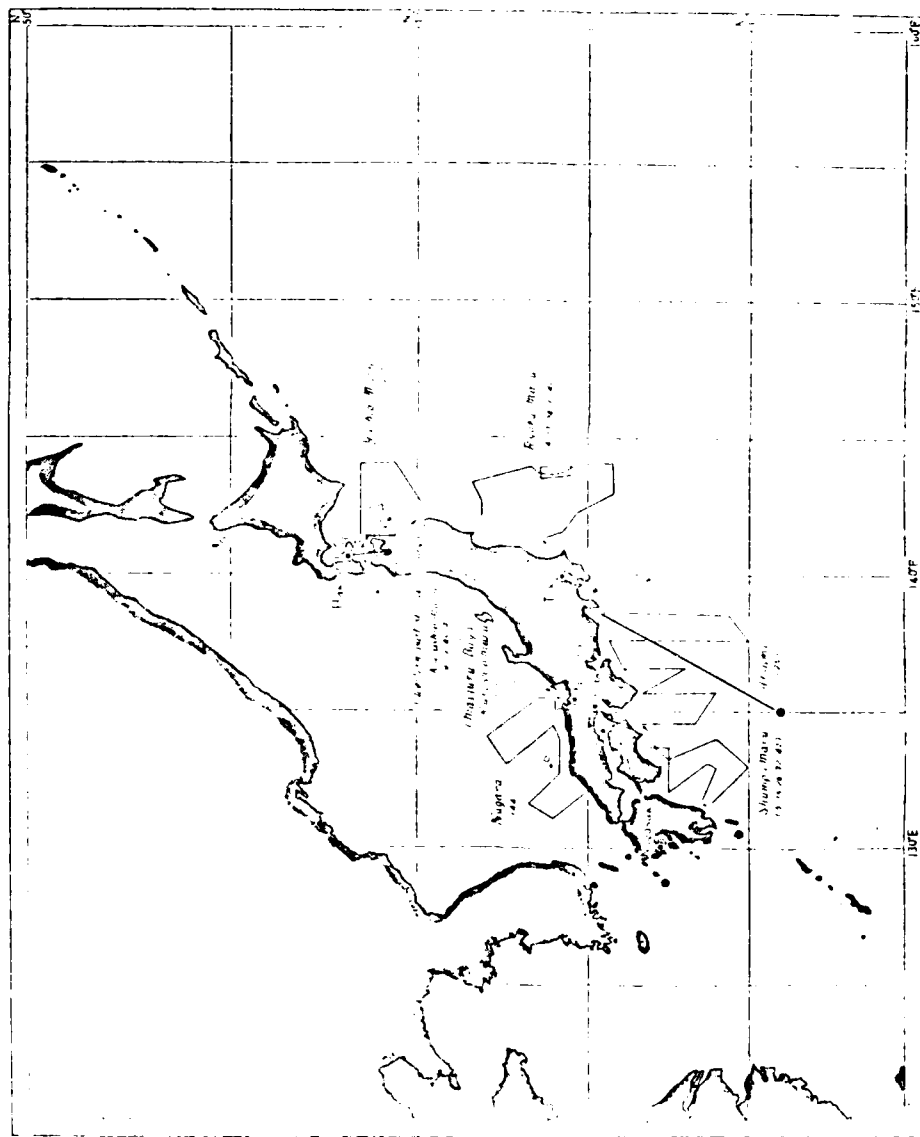


Map showing Oceanographic Stations and Sections (Apr. ~June, 1959.)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1959

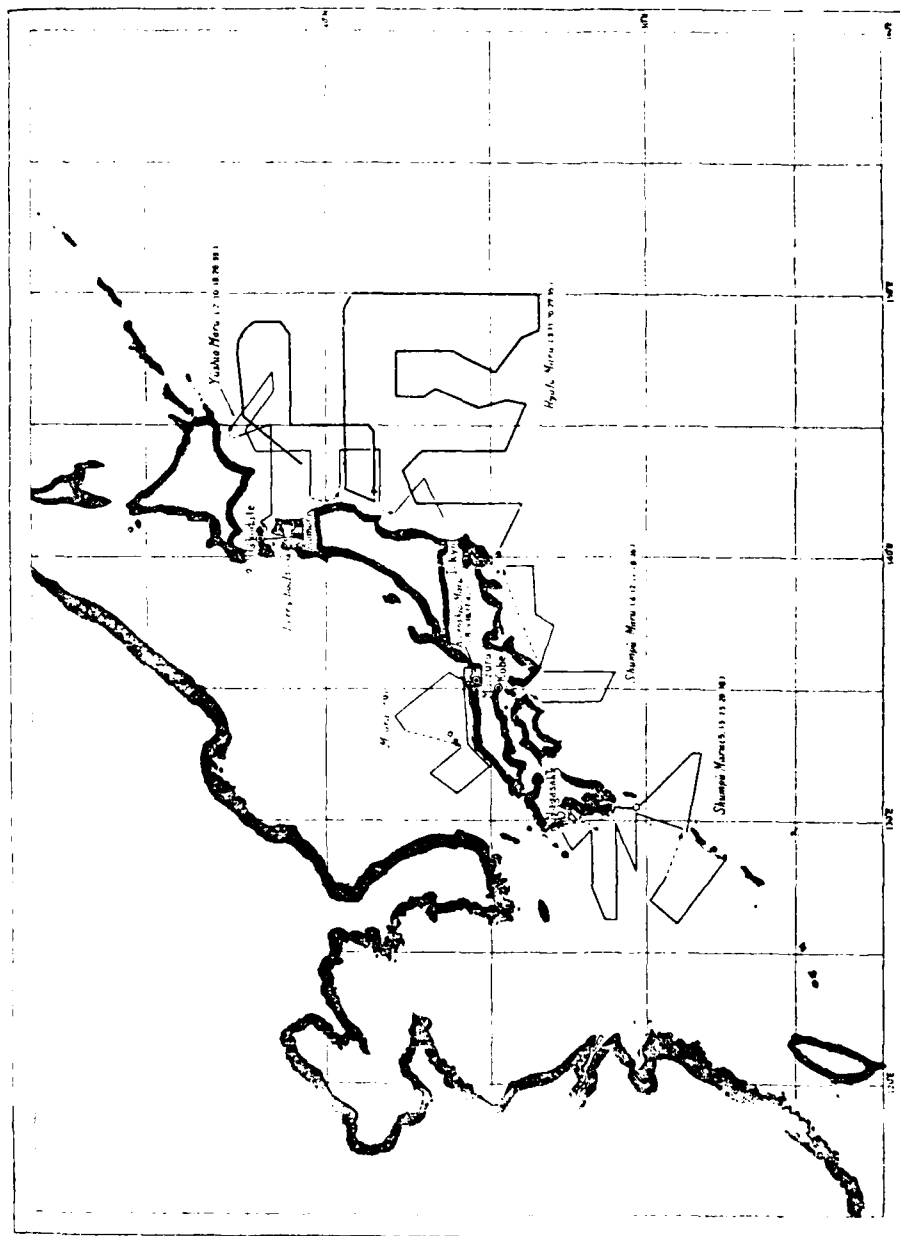


Map showing Oceanographic Stations and Sections. (July ~ Sept., 1959.)
The numeral in parentheses indicates the number of the table containing the data taken at that point

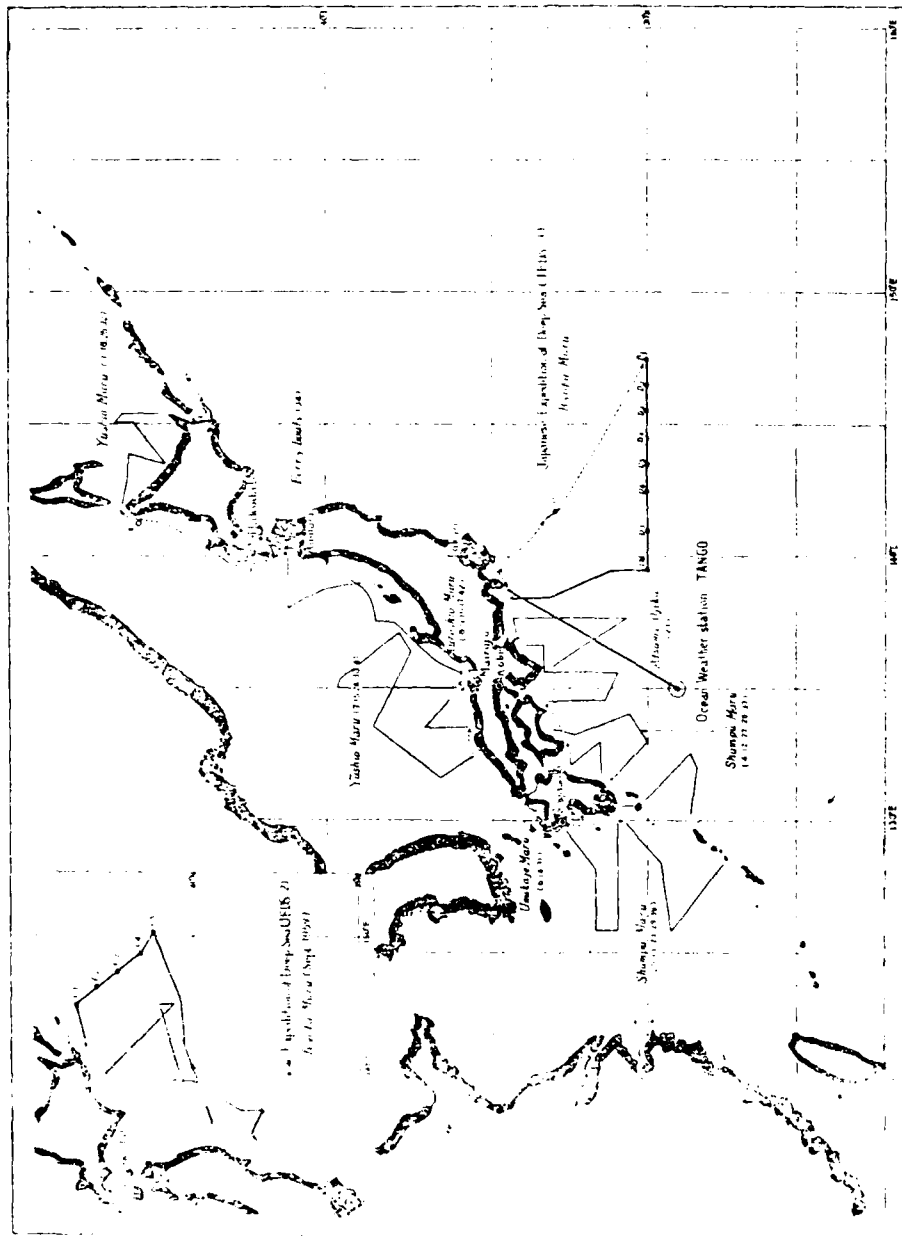


Map showing Oceanographic Stations and Sections. (Oct. ~Dec., 1959.)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1959

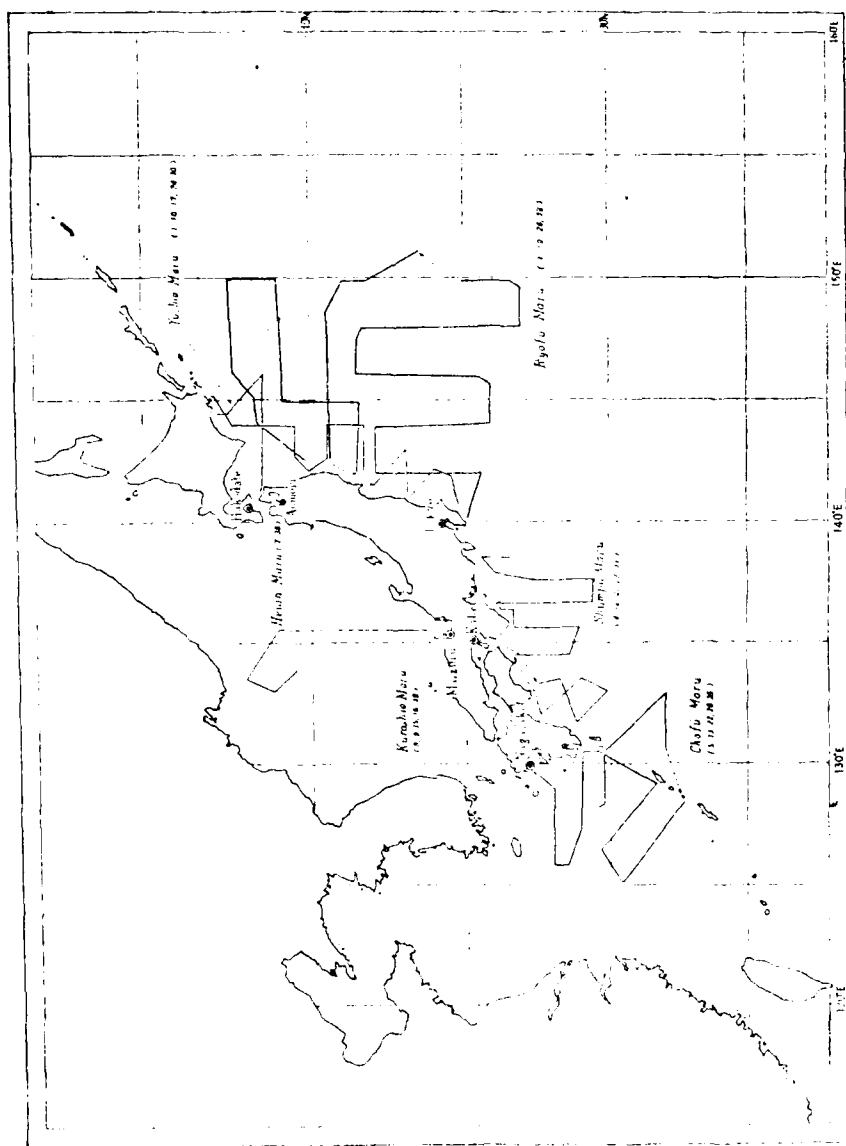


Map showing Oceanographic Stations and Sections. (January-March, 1960.) The numeral in parentheses indicates the number of the table containing the data taken at that point.

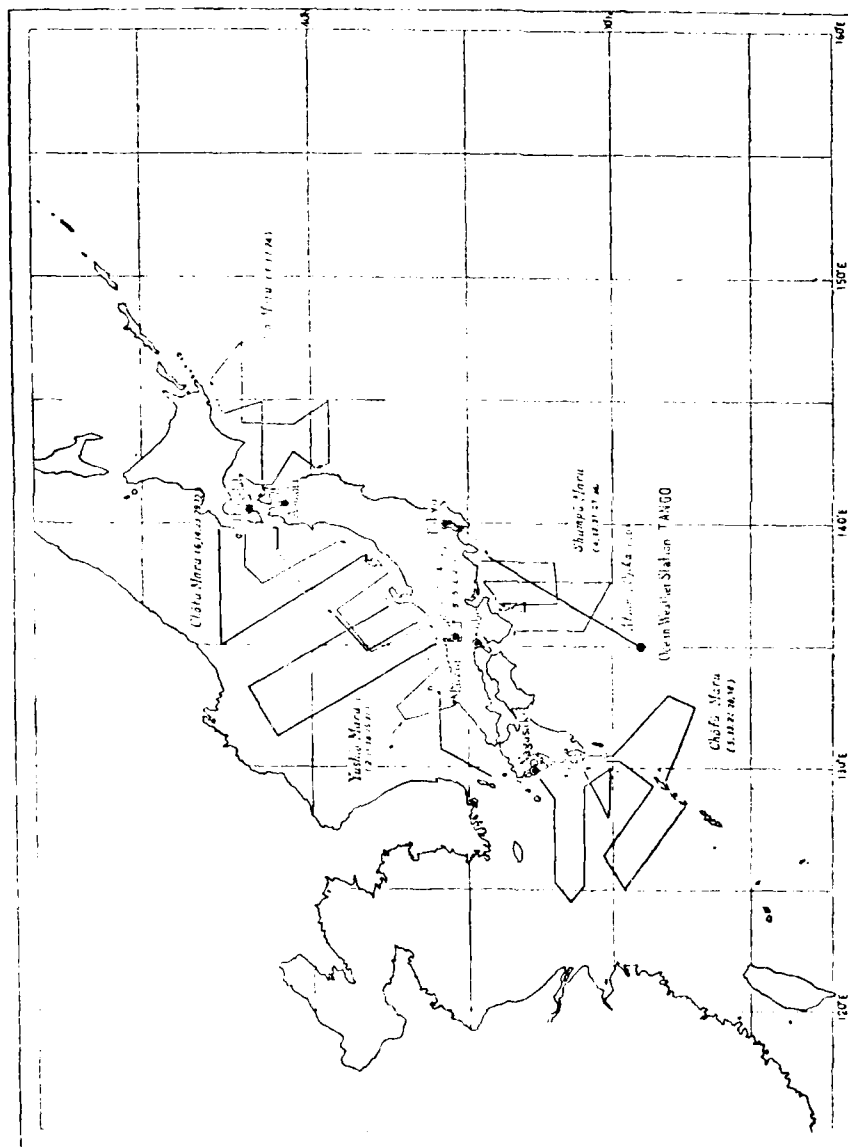


Map showing Oceanographic Stations and Sections. (April-June, 1960.) The numeral in parentheses indicates the number of the table containing the date taken at that point.

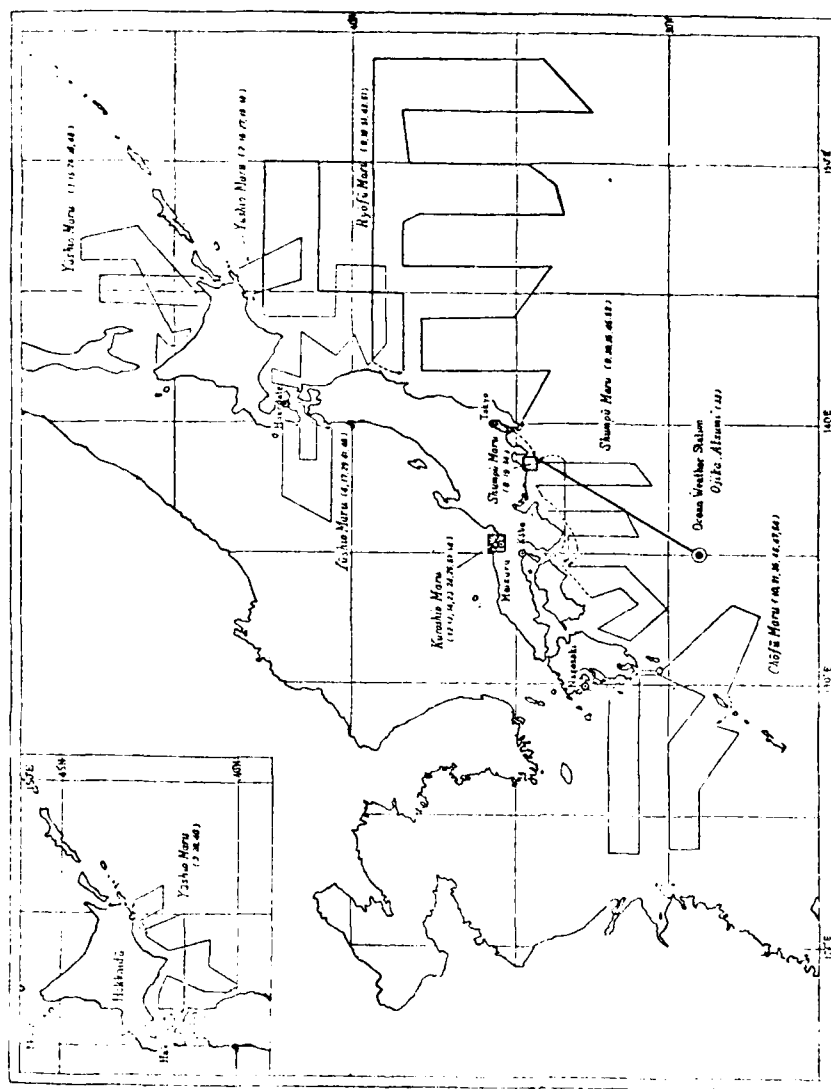
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1960



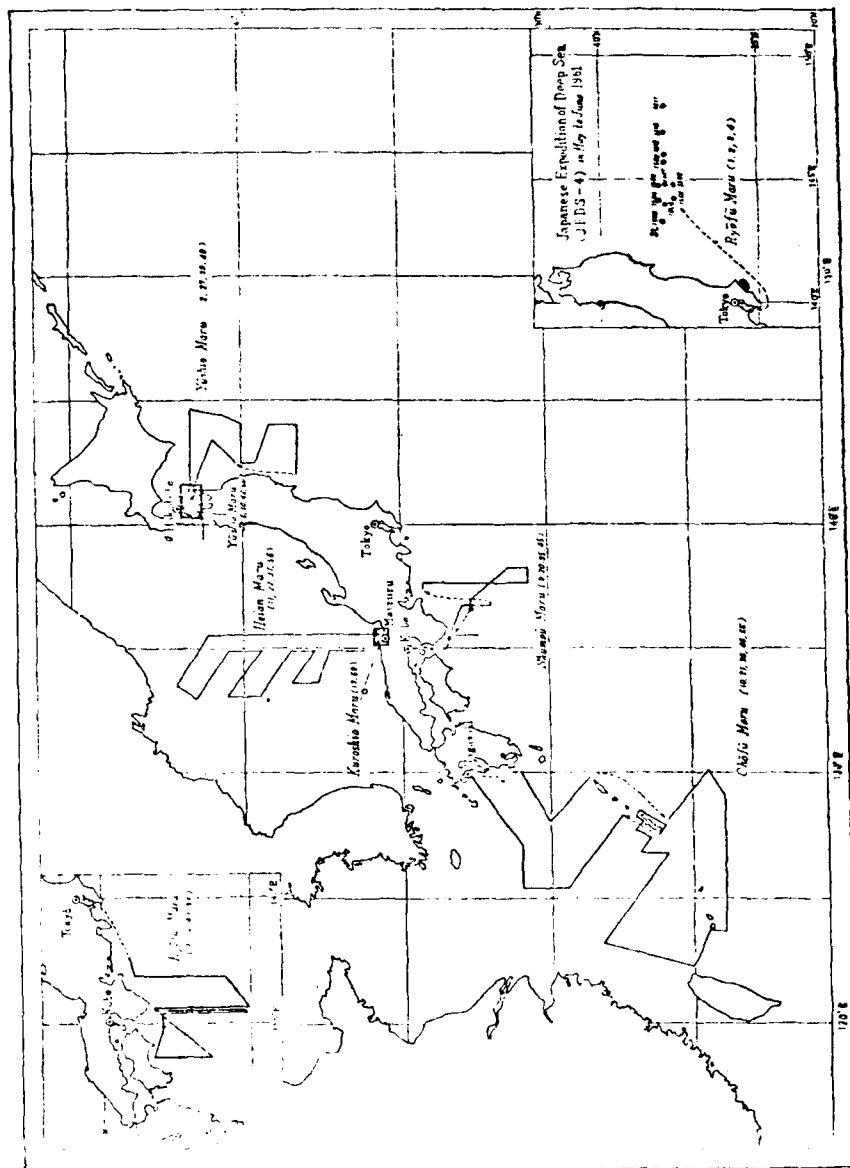
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1961



CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1961

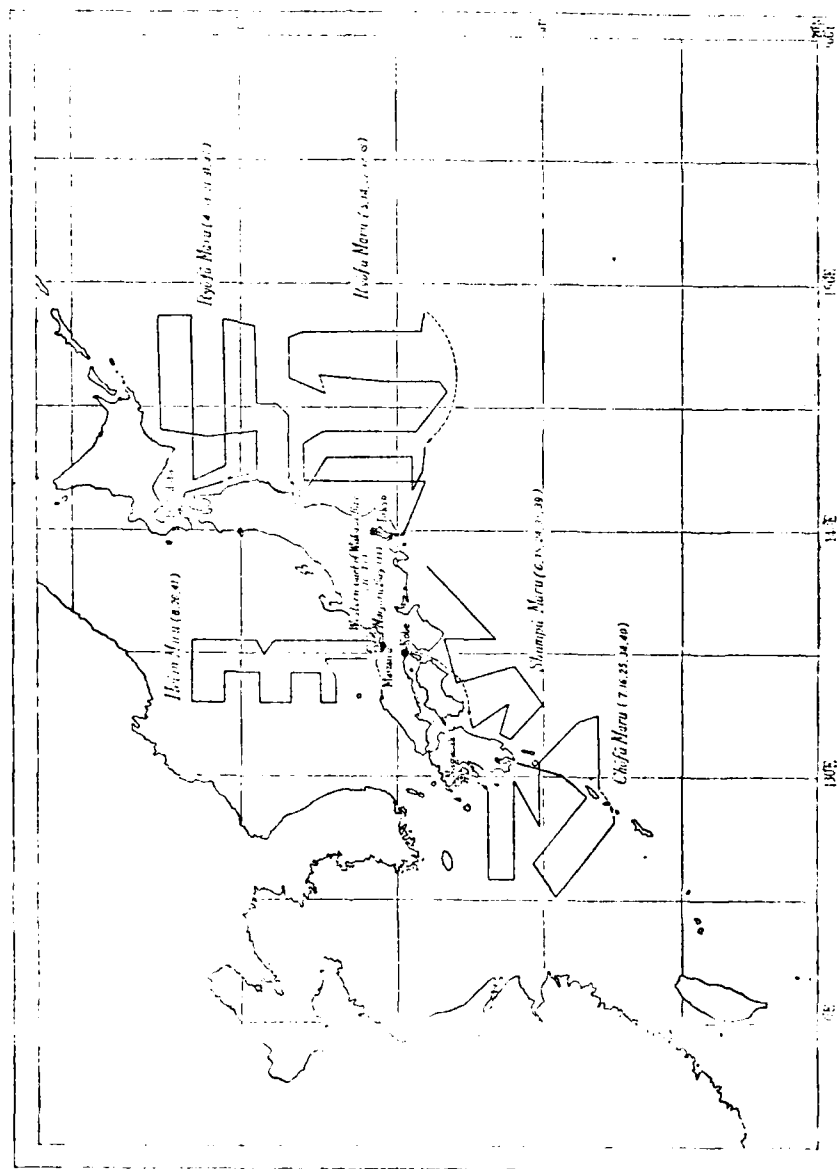


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1961

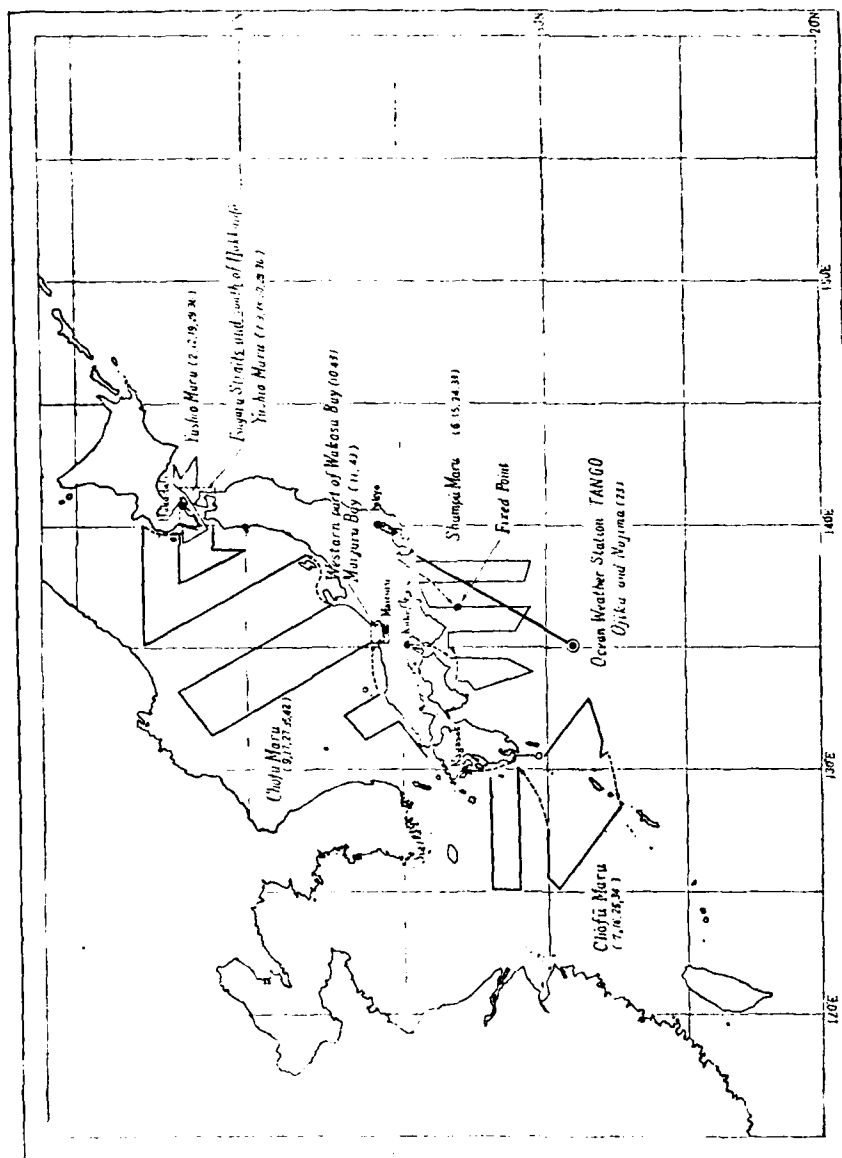


Map showing Oceanographic Stations and Sections. (Oct.~Dec, 1961)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1961

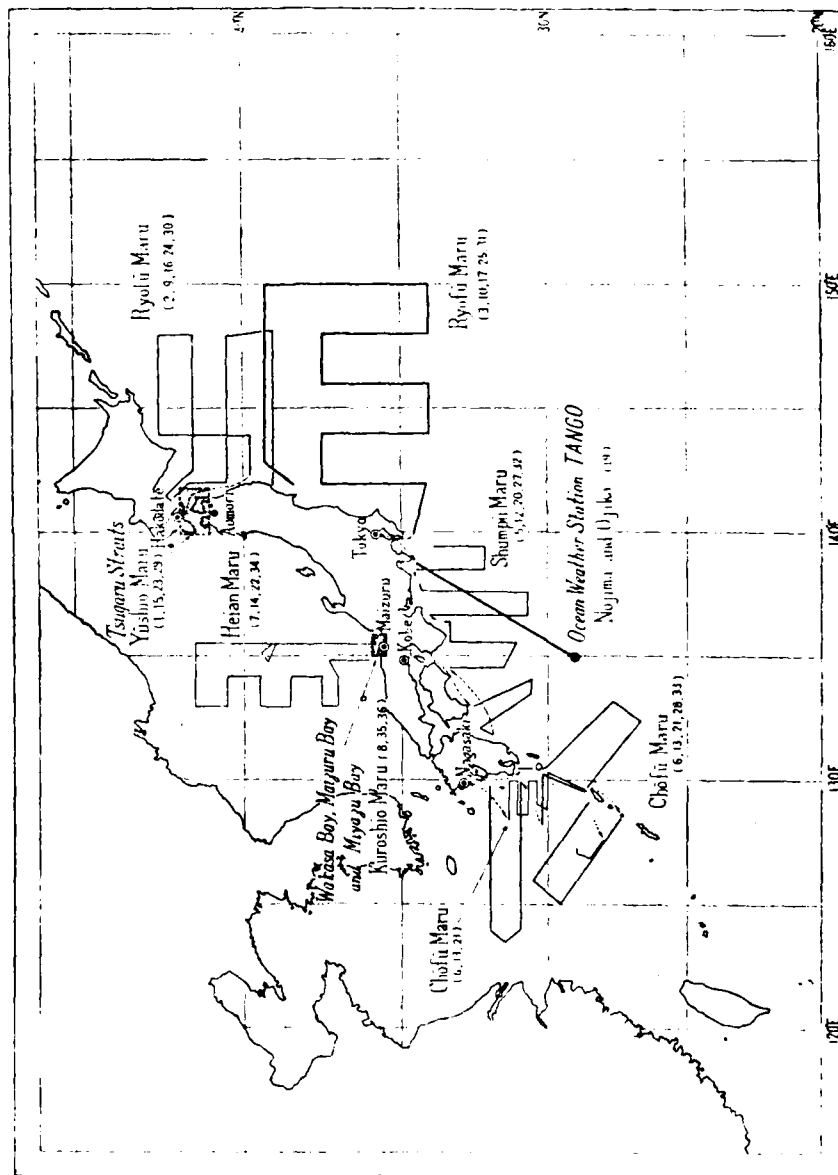


Map showing Oceanographic Stations and Sections. (Jan.~Mar., 1962)
The numeral in parentheses indicates the number of the table containing the data taken at that point.



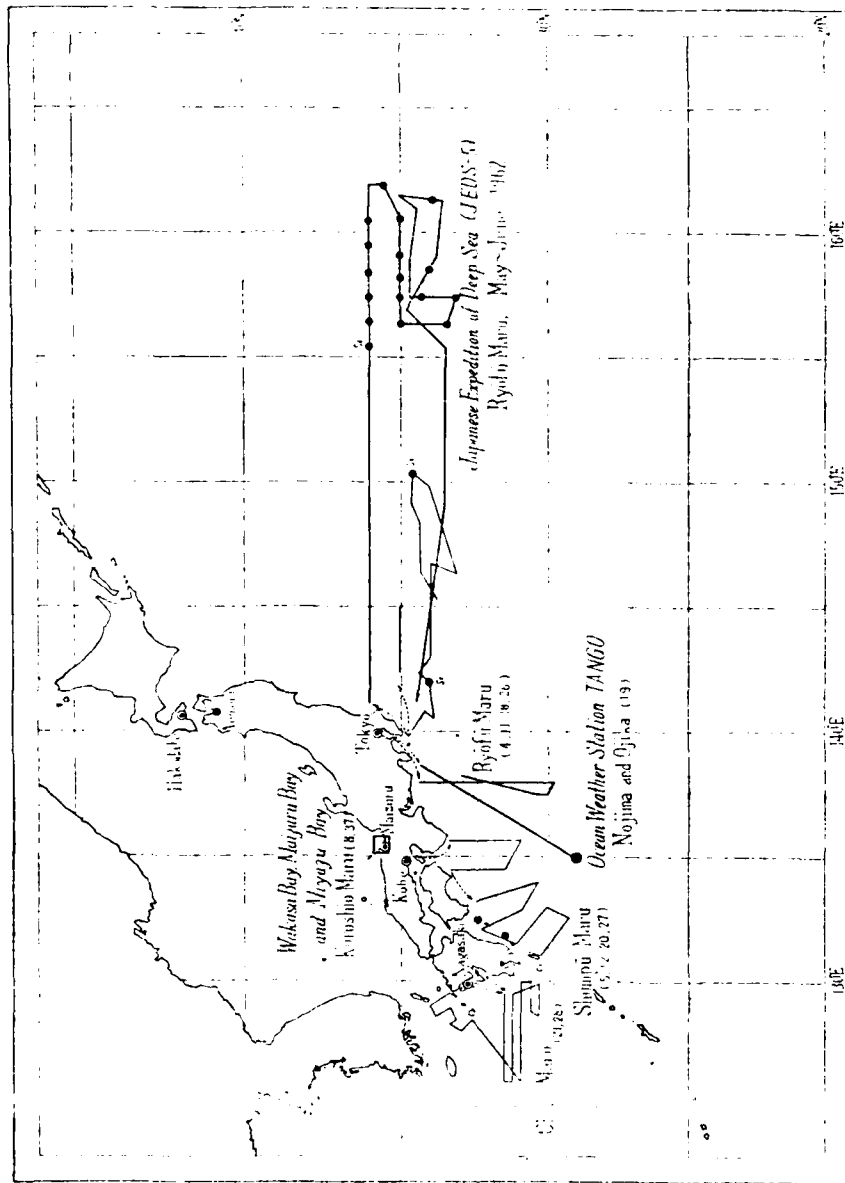
Map showing Oceanographic Stations and Sections. (April-June, 1962)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1962



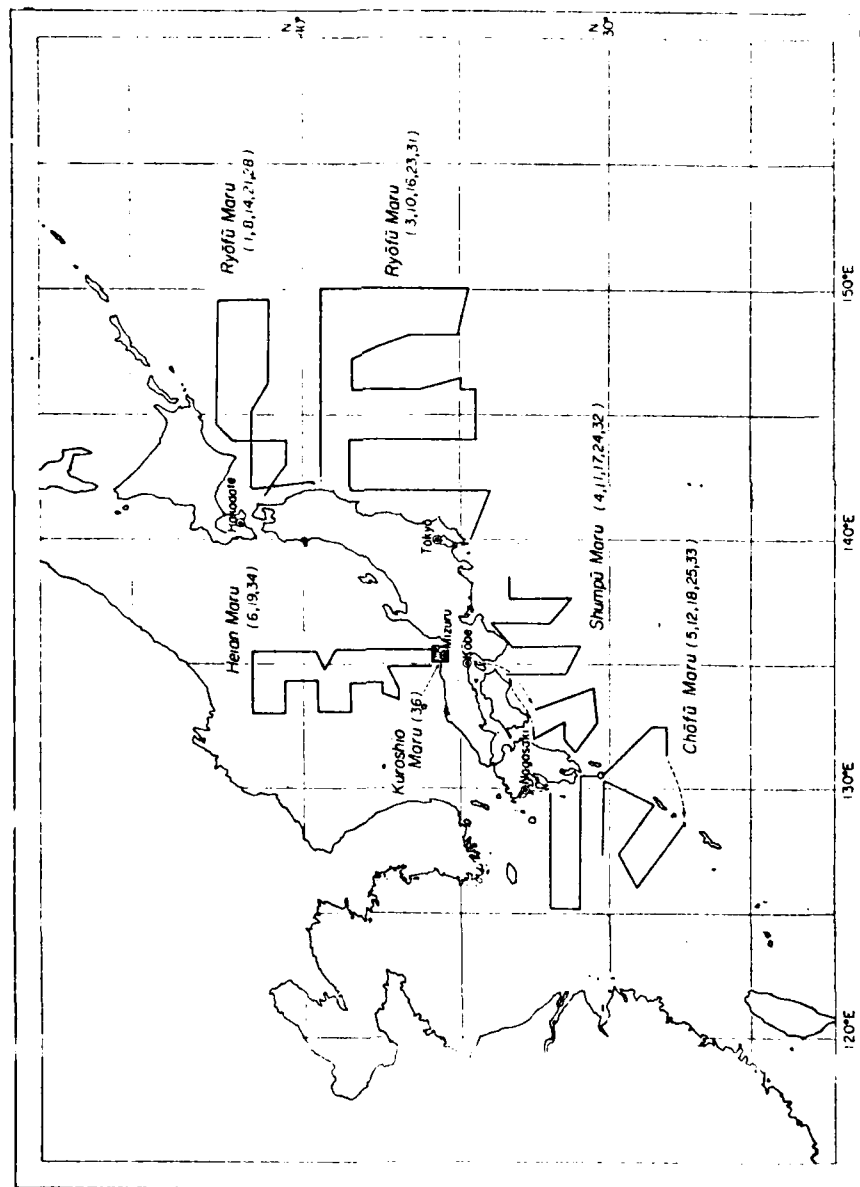
Map showing Oceanographic Stations and Sections. (July~Sept., 1962)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

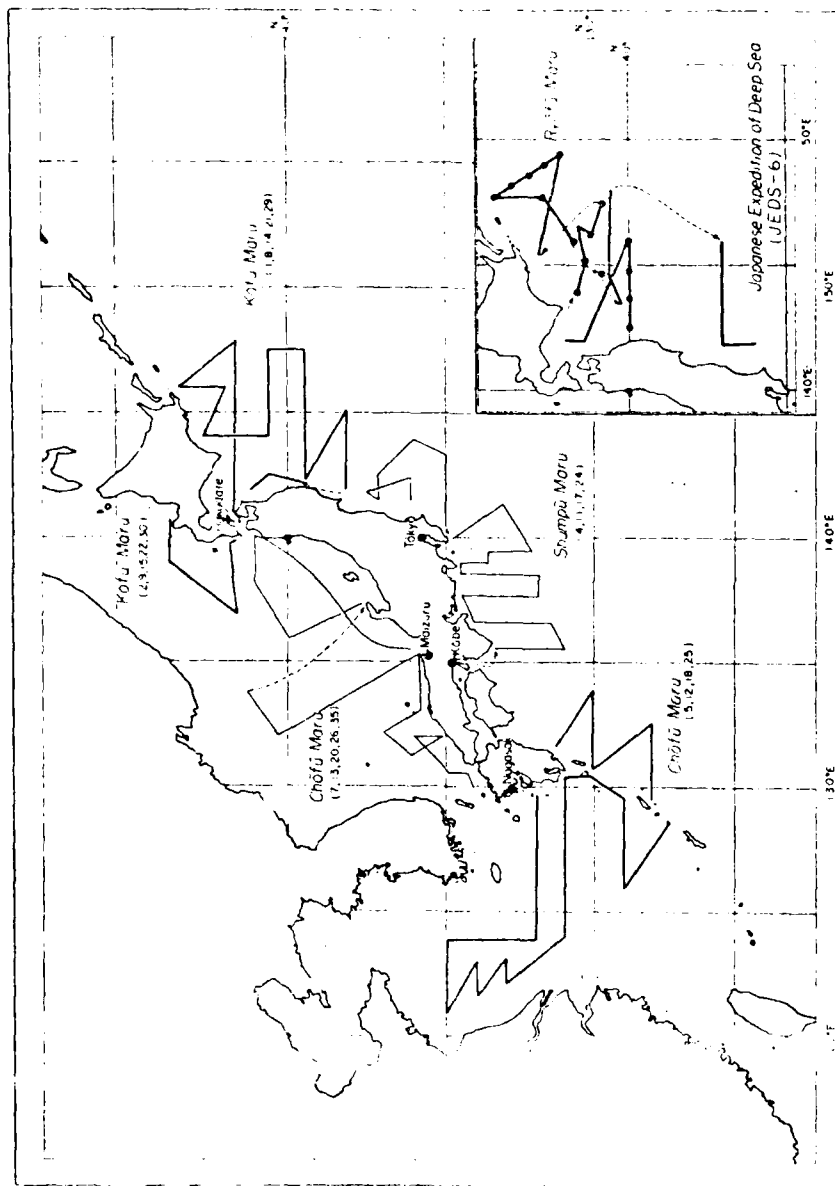
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1962



Map showing Oceanographic Stations and Sections. (Oct.~Dec., 1962)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

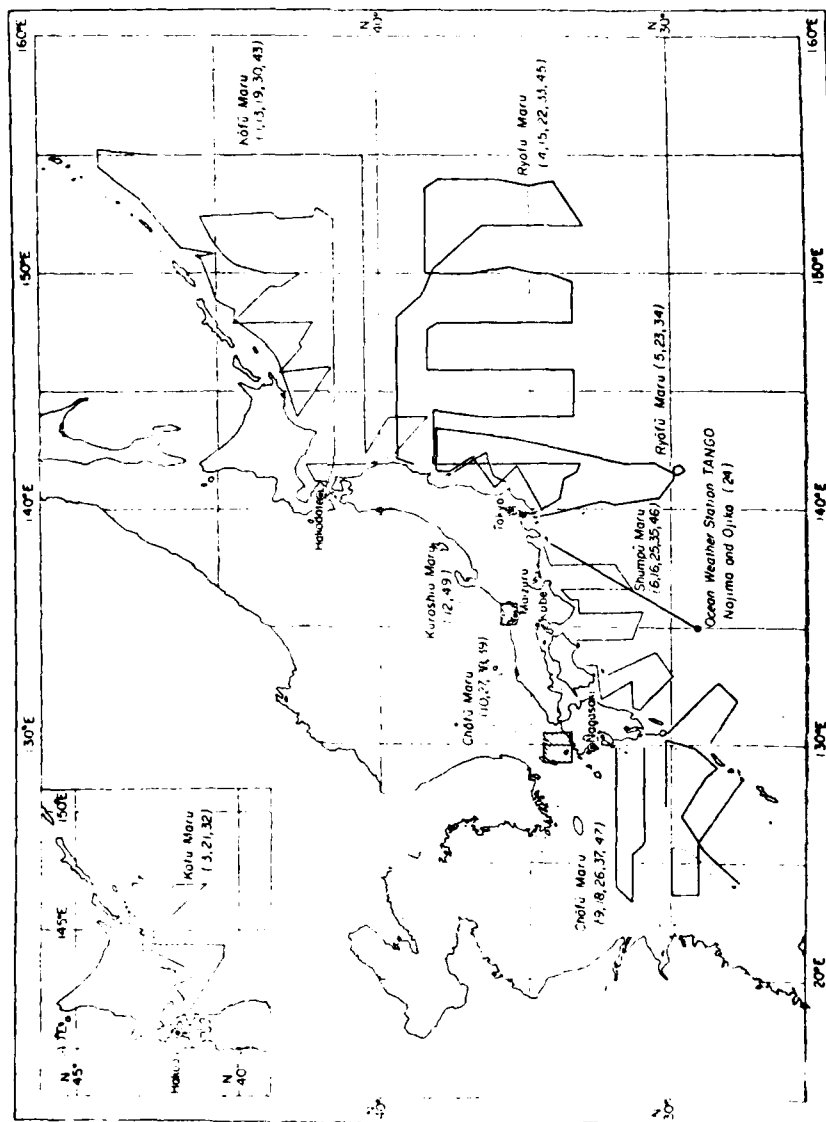
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1962



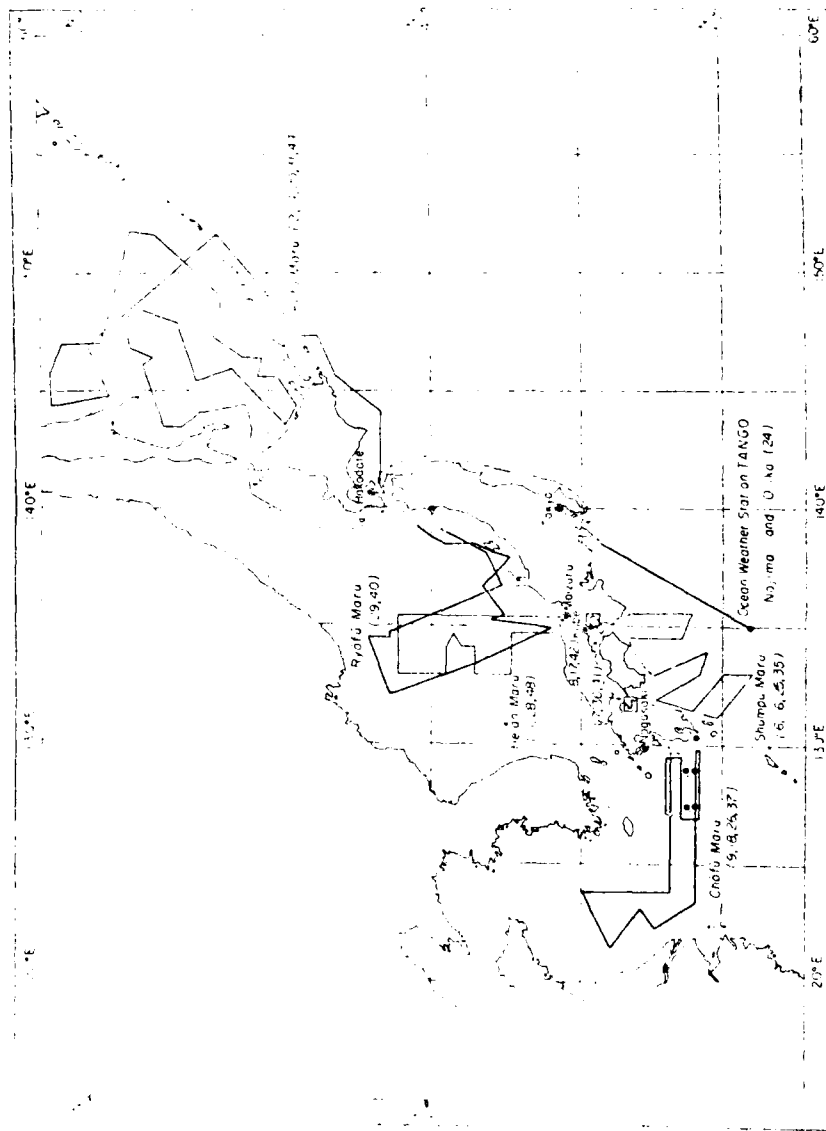


Map showing Oceanographic Stations and Sections. (January~March, 1963)
 The numeral in parentheses indicates the number of the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1963

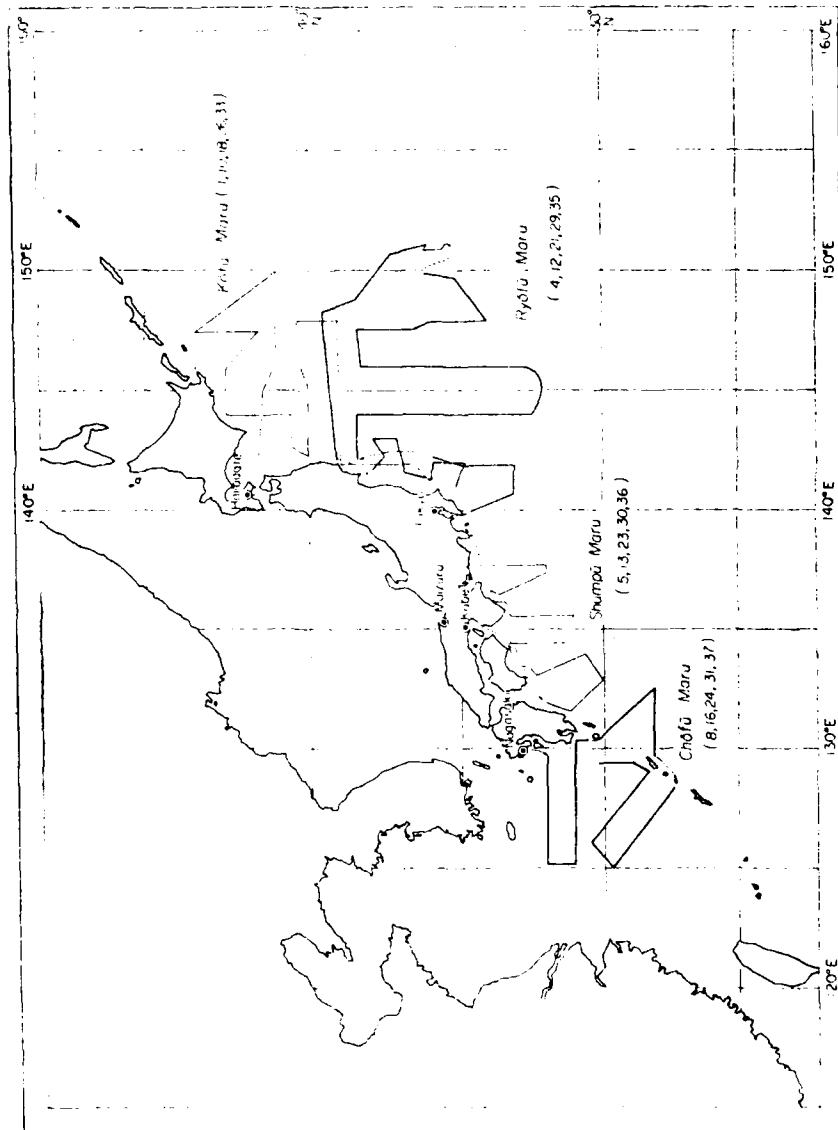


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1963



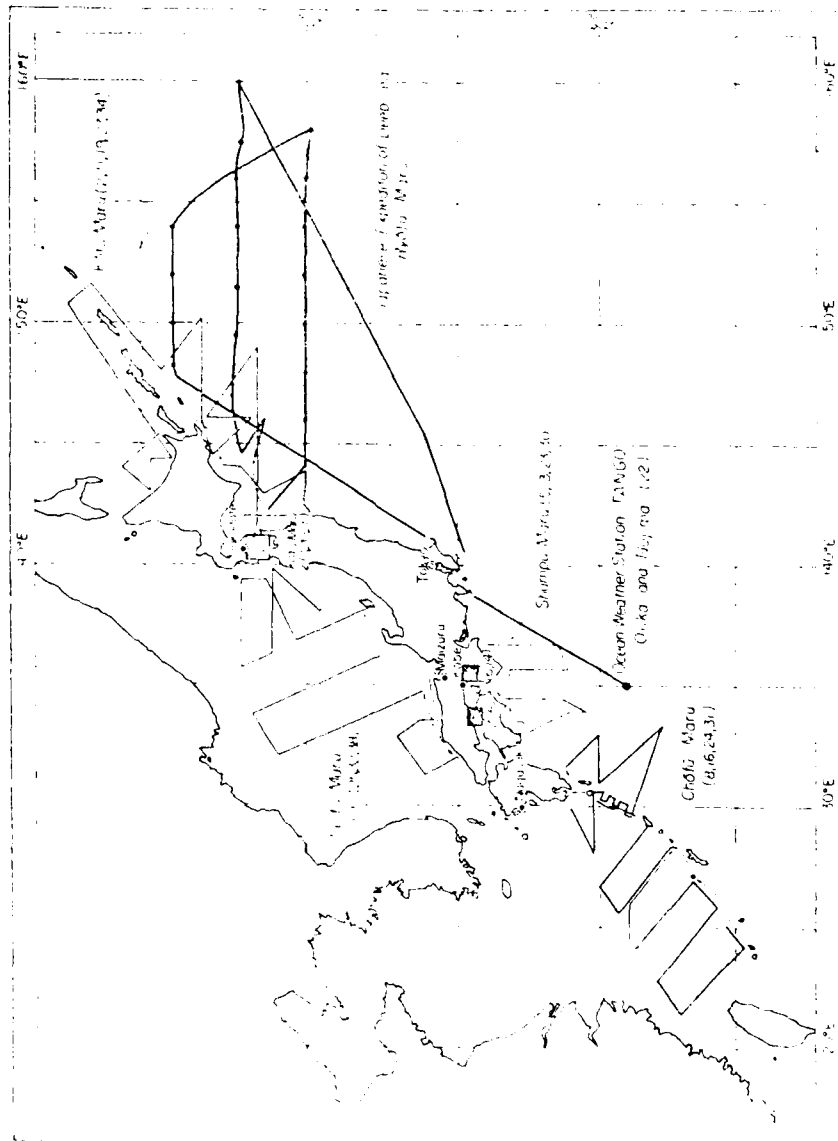
Map showing Oceanographic Stations and Sections. (October-December, 1963)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1963



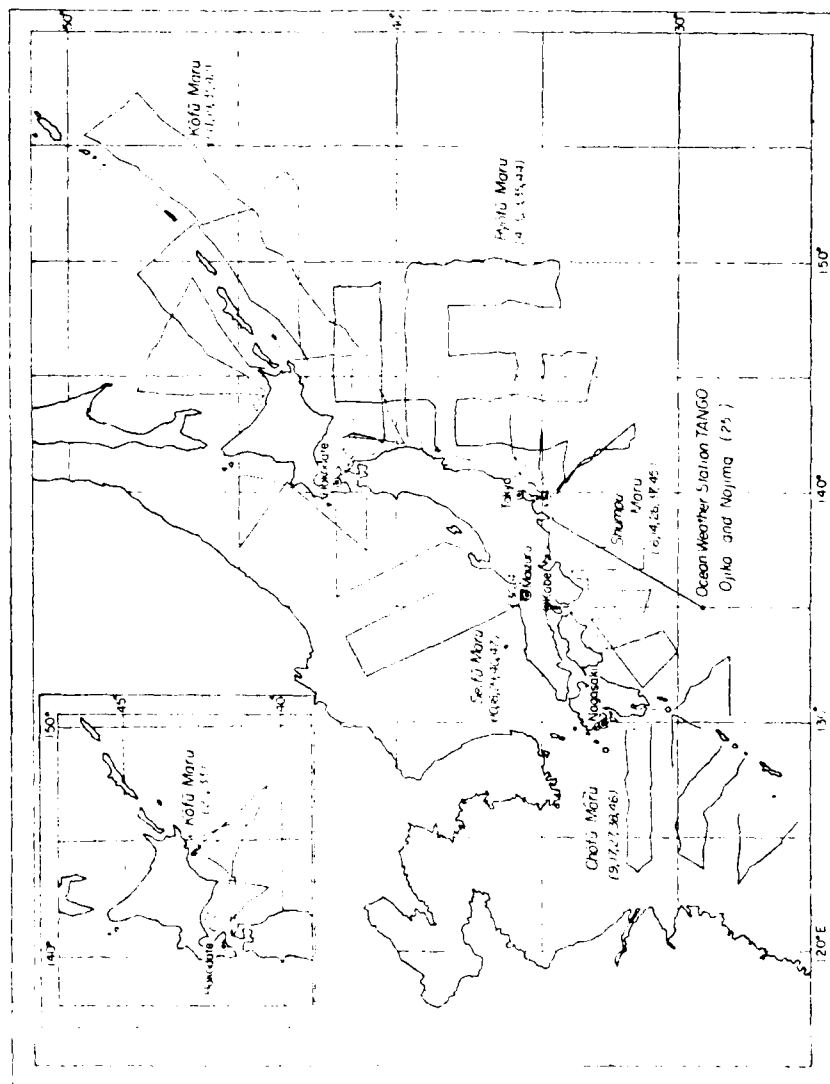
Map showing Oceanographic Stations and Sections. (January~March, 1964)
 The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1964



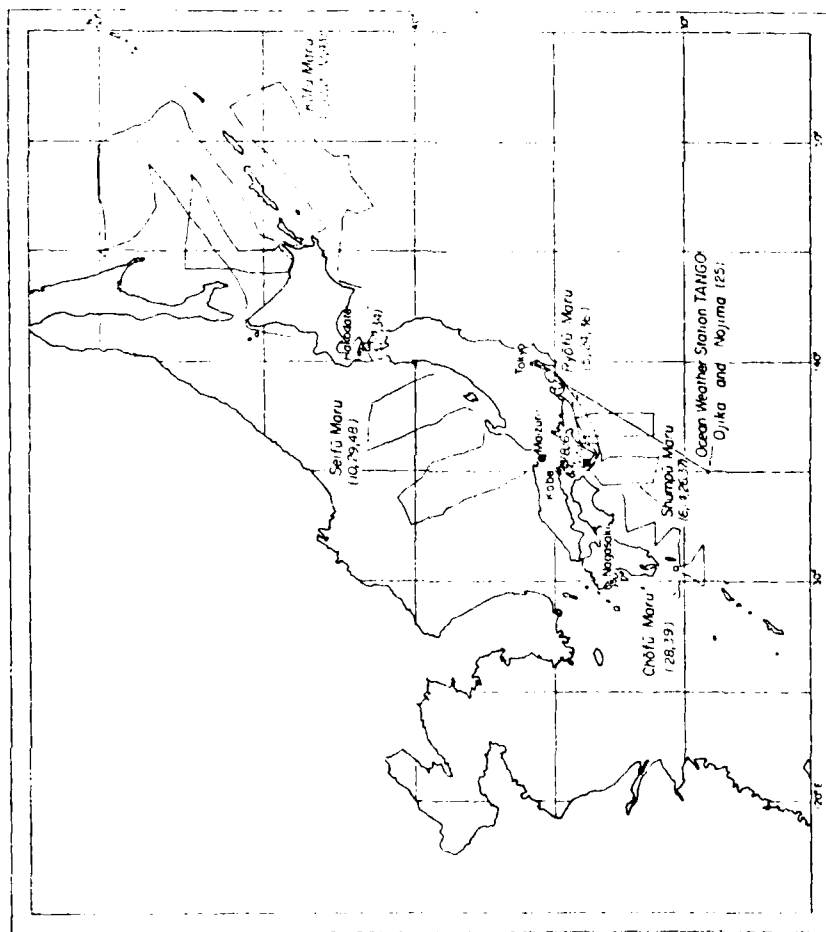
Map showing Oceanographic Stations and Sections. (April-June, 1964)
The number in parentheses indicates the number of the table containing the data taken at that point

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1964



Map showing Oceanographic Stations and Sections. (July~September, 1964)
 The numeral in parentheses indicates the number of the table containing the data taken at that point.

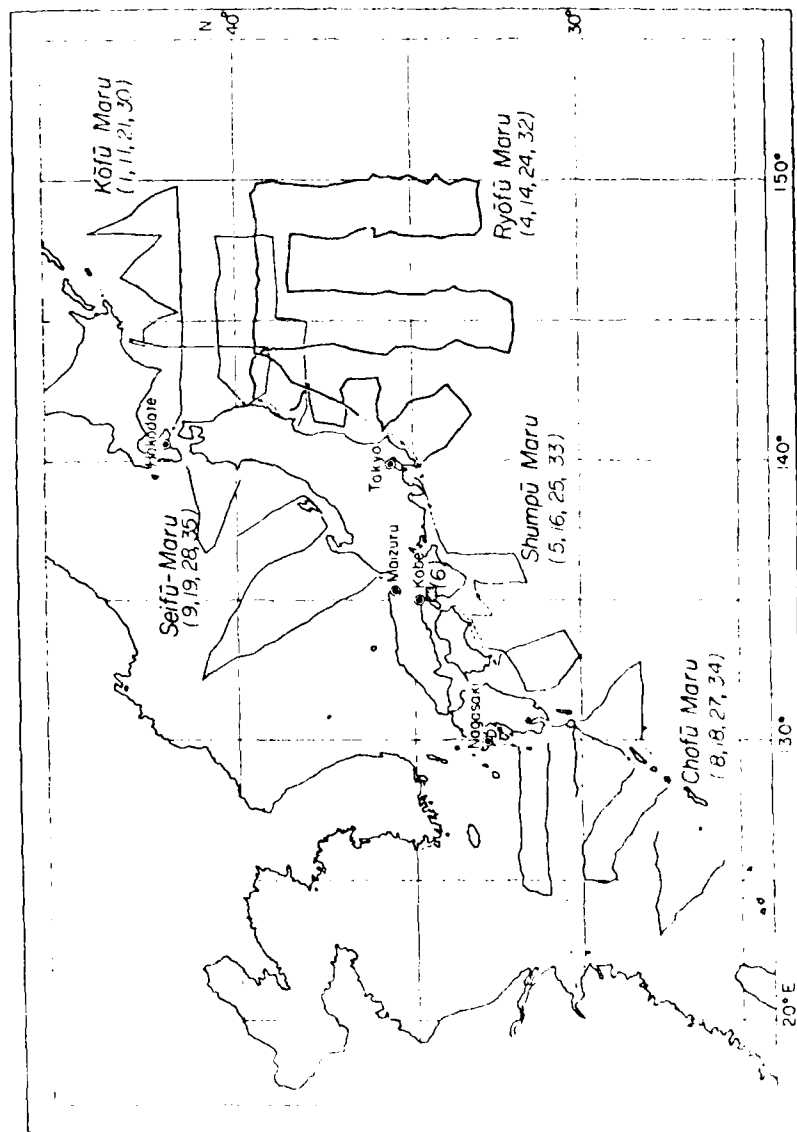
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1964



Map showing Oceanographic Stations and Sections. (October~December, 1964)

The numeral in parentheses indicates the number of the table containing the data taken at that point.

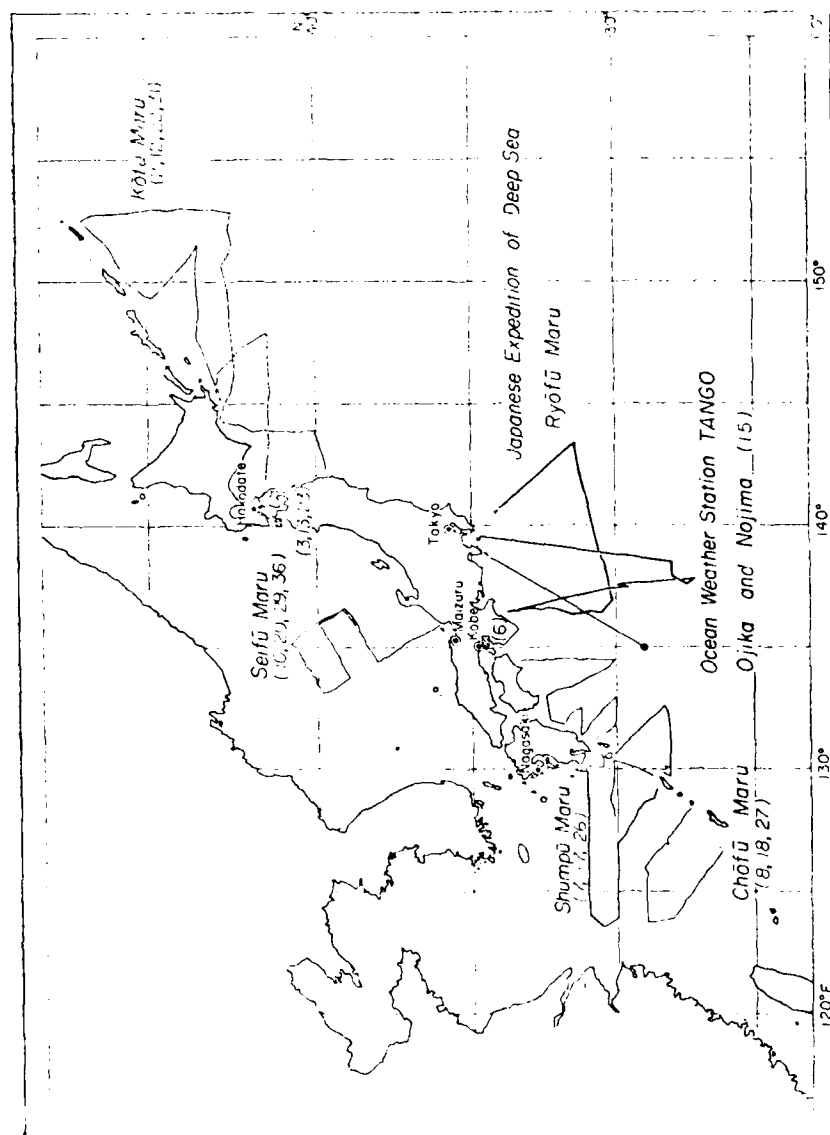
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1964



Map showing Oceanographic Stations and Sections. (January-March, 1965)

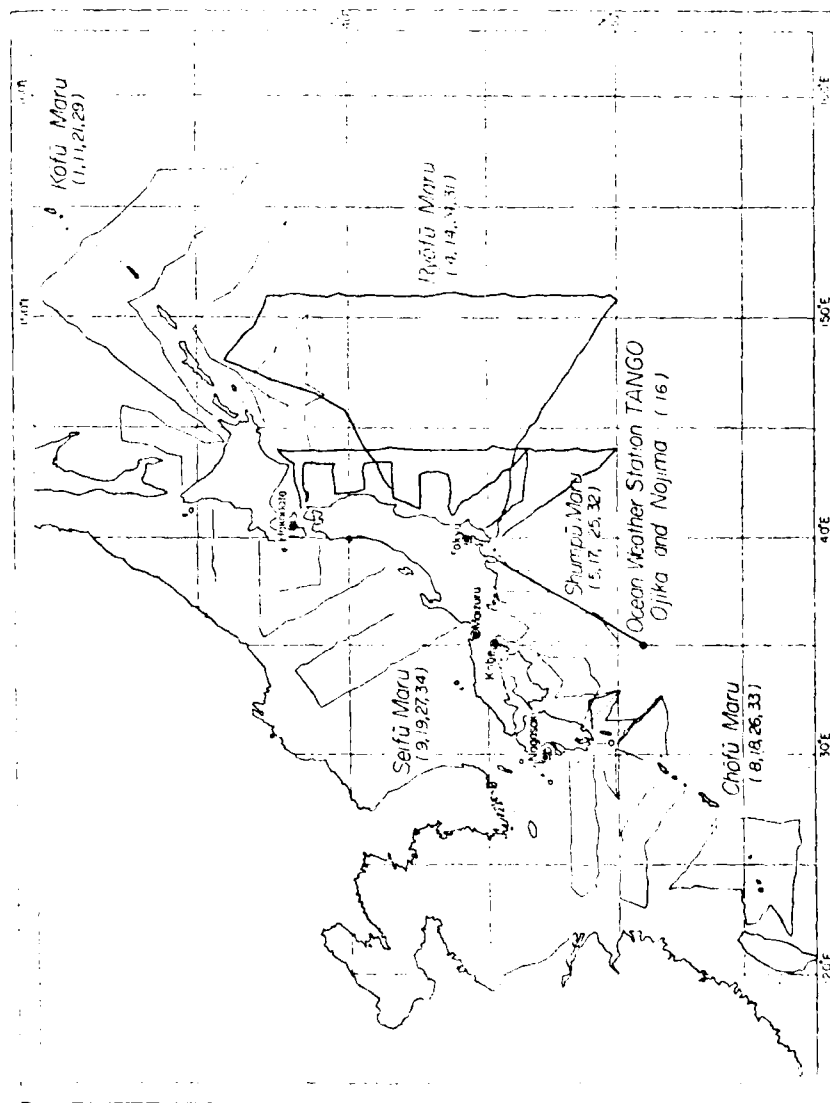
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1965

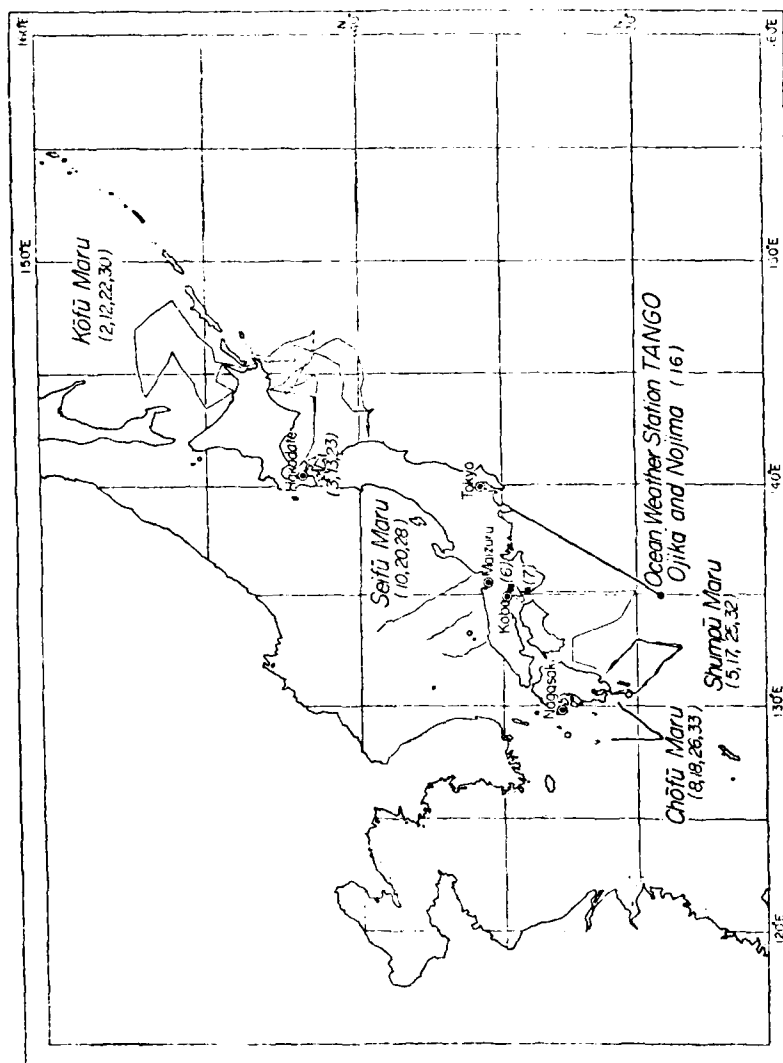


Map showing Oceanographic Stations and Sections. (April-June, 1965)
 The numeral in parentheses indicates the number of the table containing the data taken at that point.

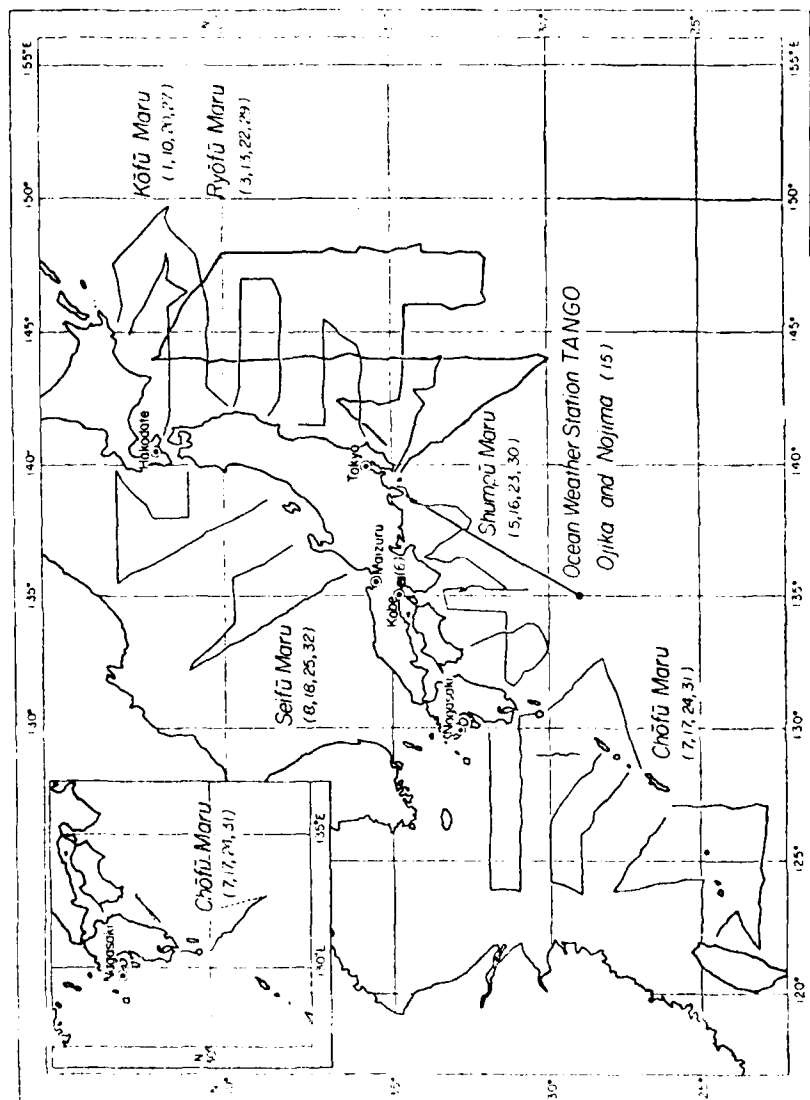
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1965



CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1965

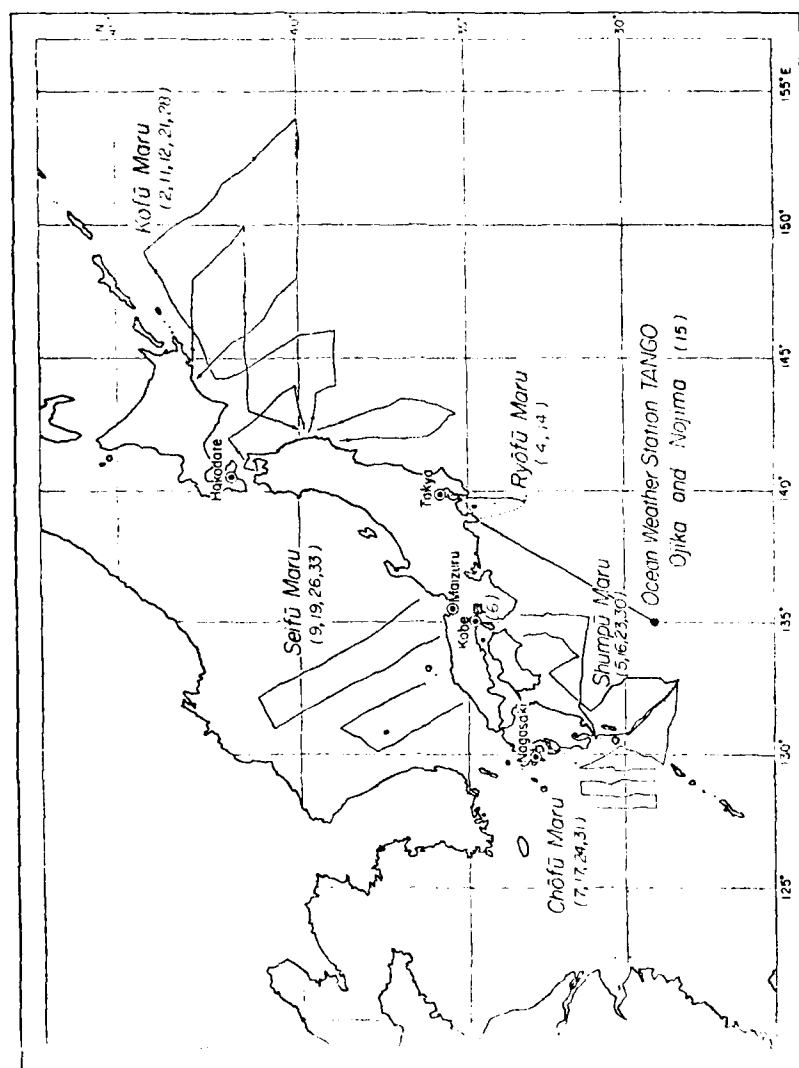


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1965



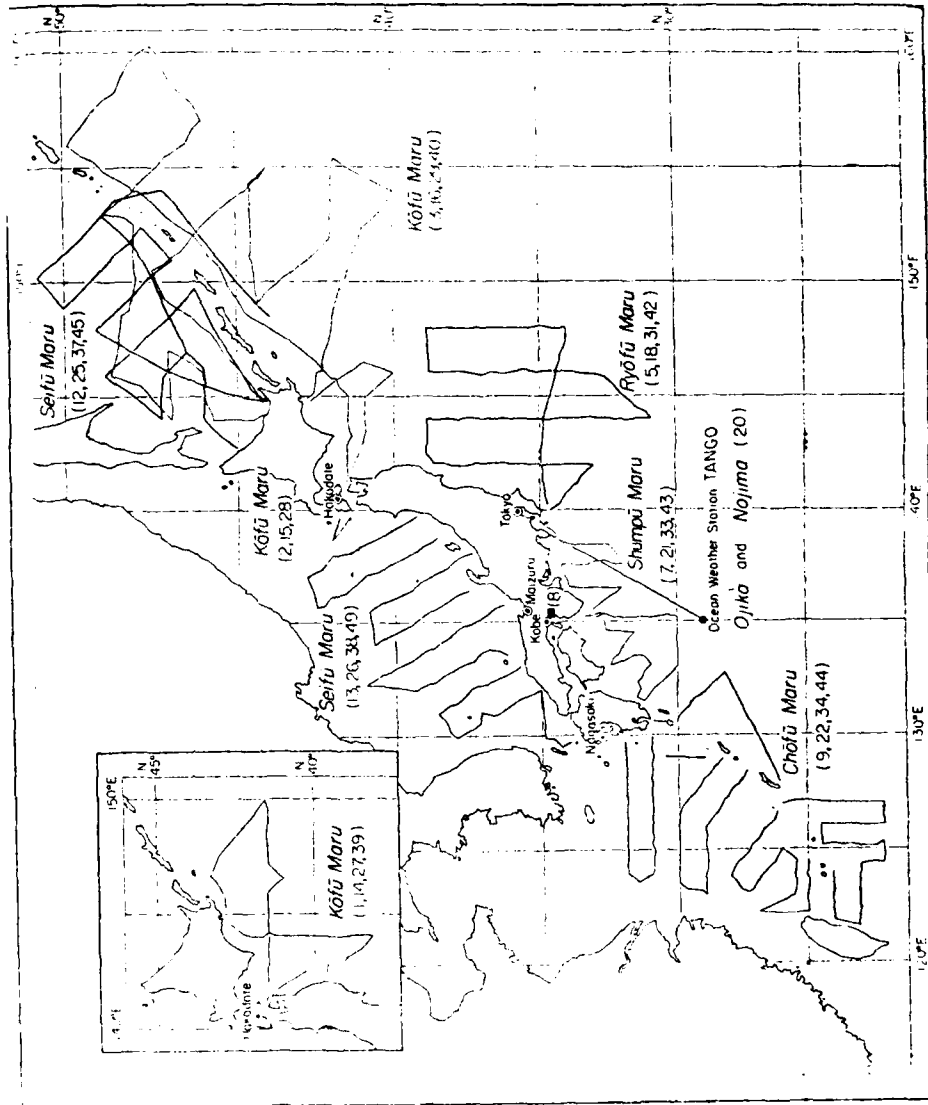
Map showing Oceanographic Stations and Sections. (January-March, 1966)
 The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1966

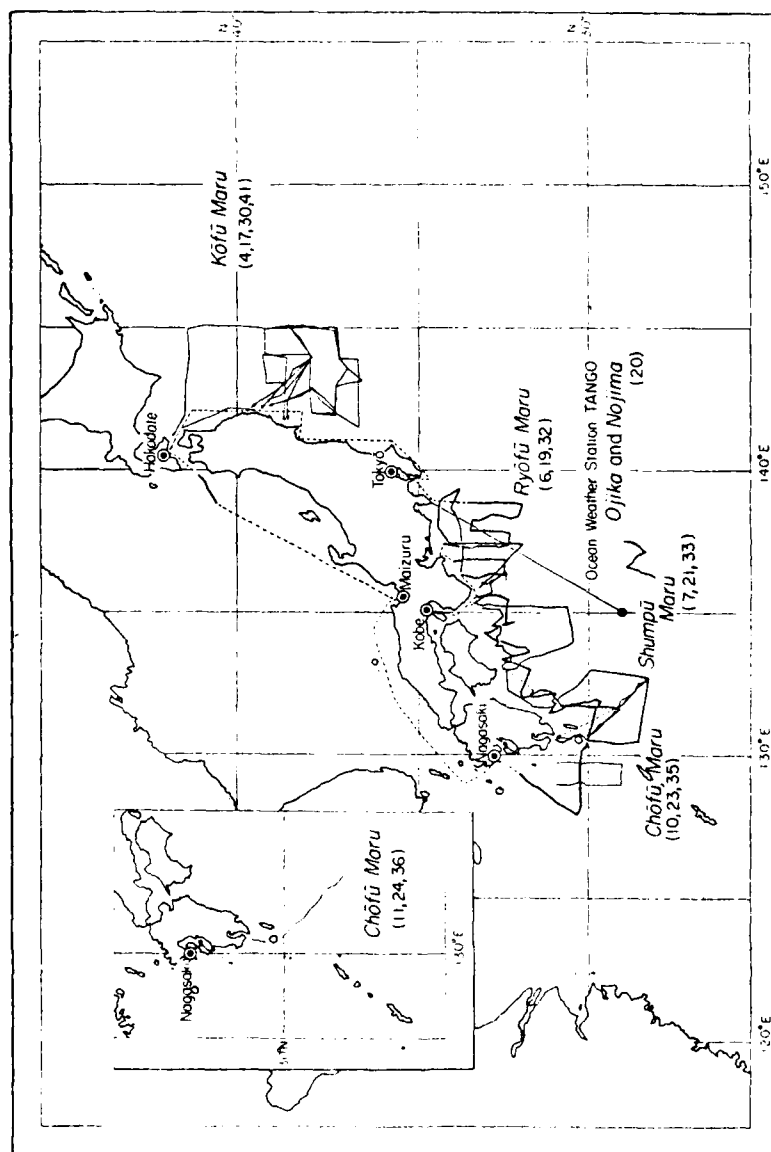


Map showing Oceanographic Stations and Sections. (April-June, 1966)
 The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1966

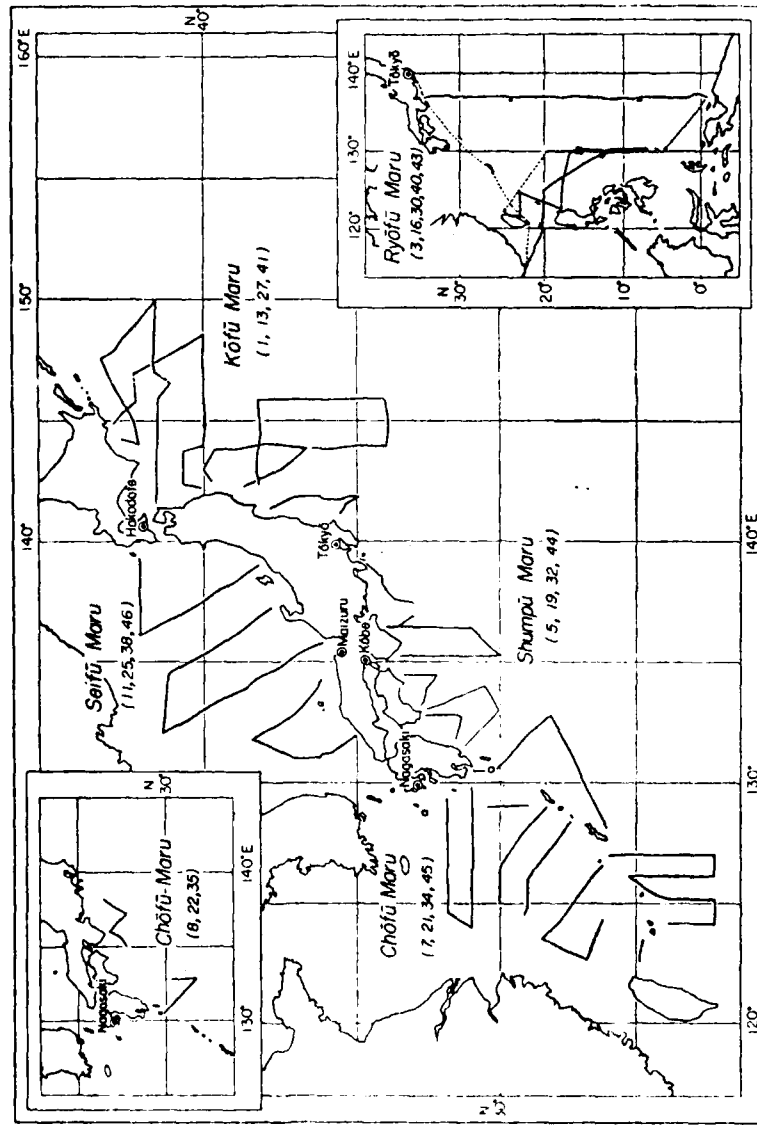


Map showing Oceanographic Stations and Sections. (July~September, 1966)
The numeral in parentheses indicates the number of the table containing the data taken at that point.



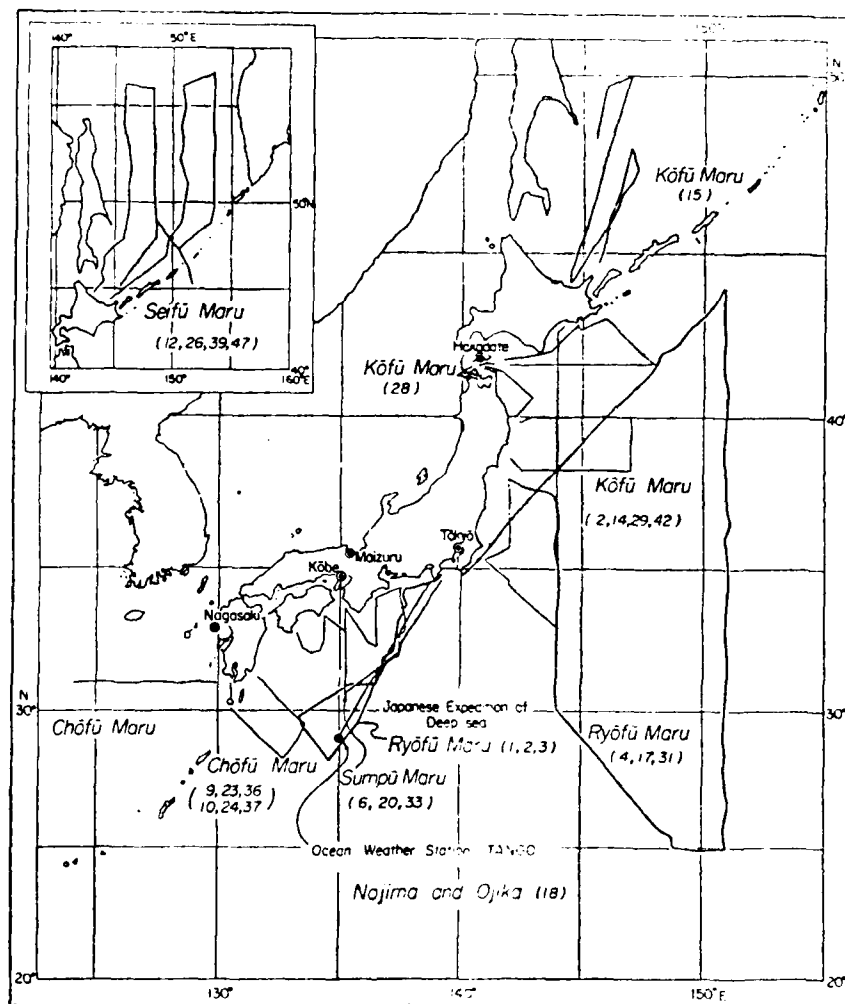
Map showing Oceanographic Stations and Sections. (October-December, 1966)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1966



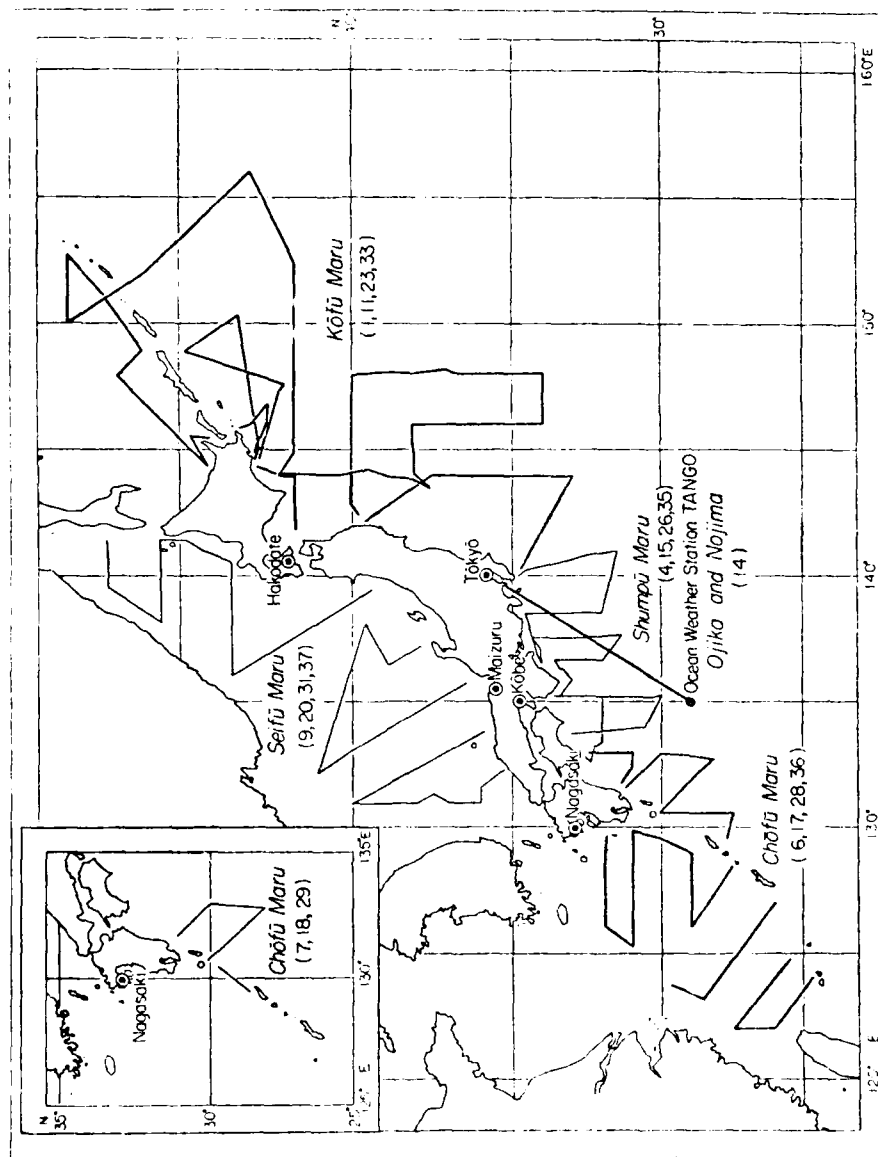
Map showing Oceanographic Stations and Sections. (January~March, 1967)
The numeral in parentheses indicates the number of the table containing the data taken at that point.

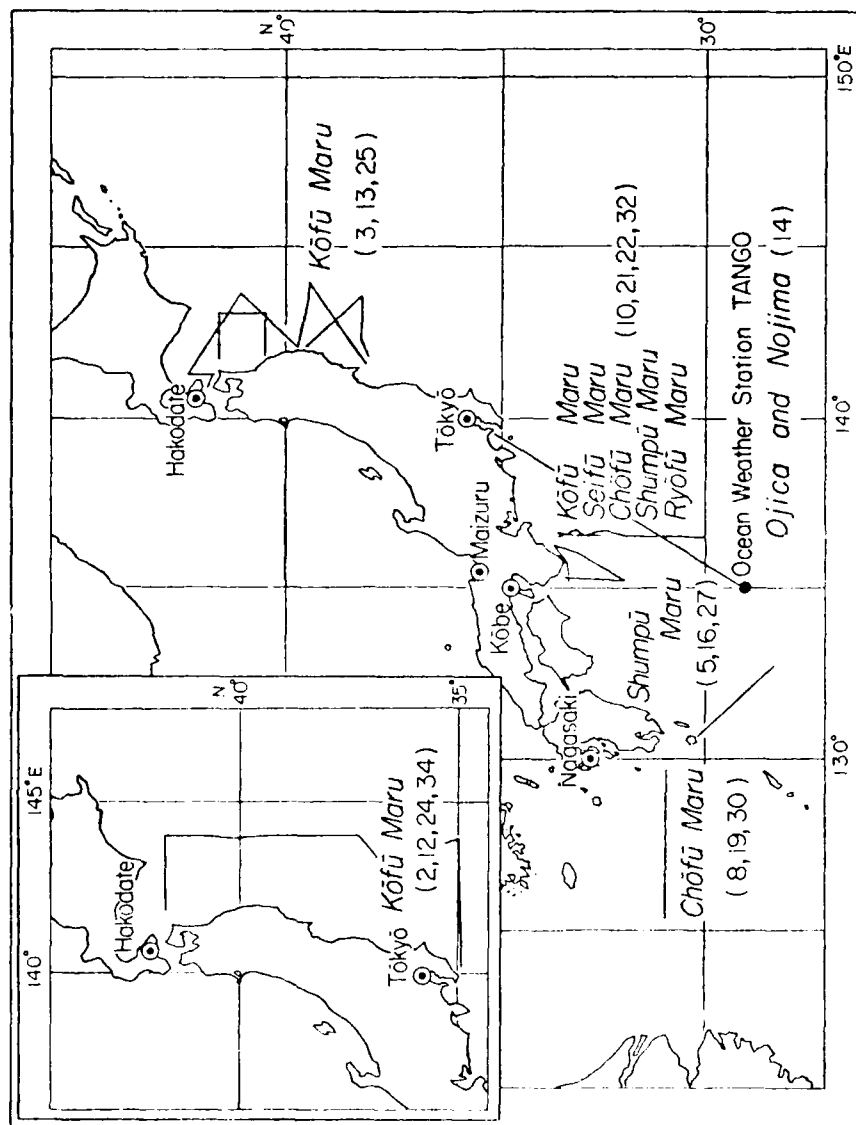
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1967



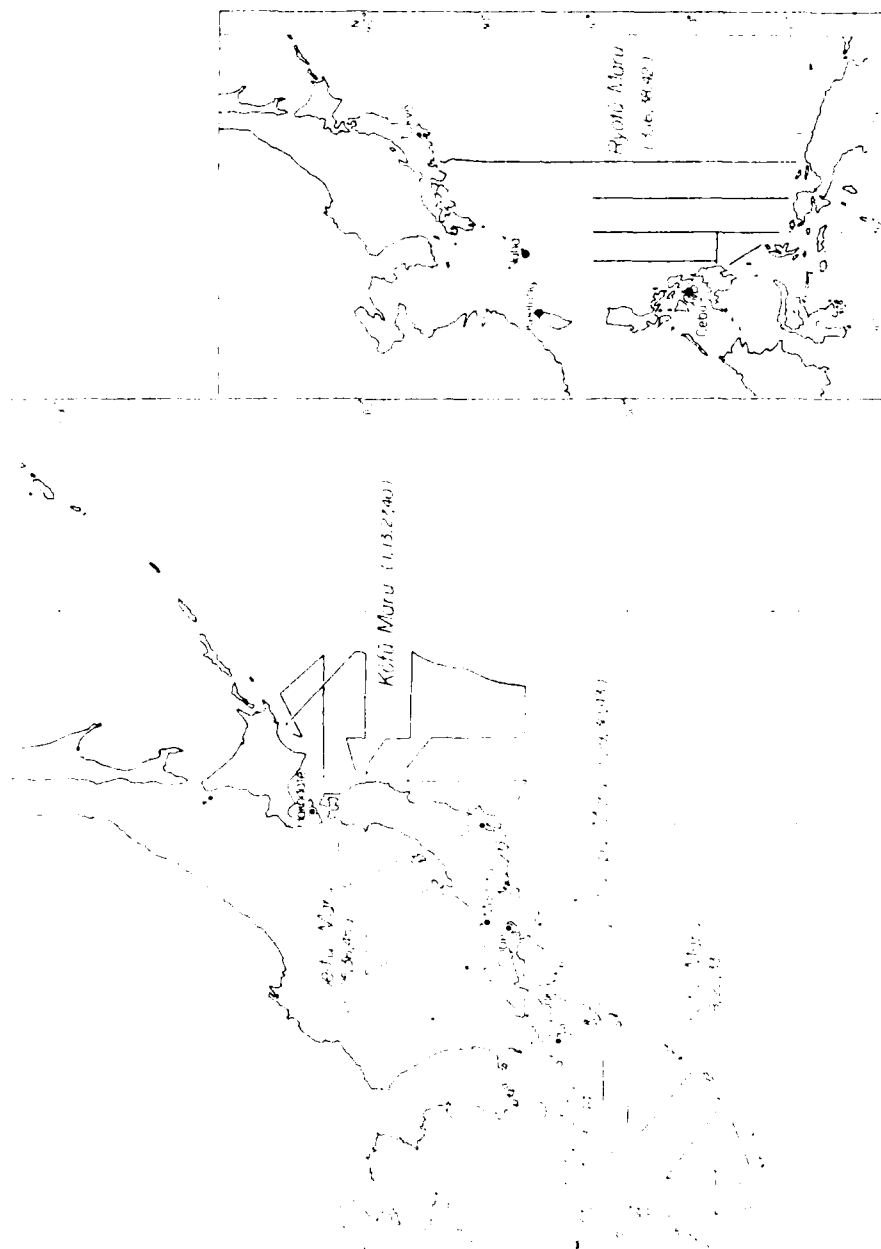
Map showing Oceanographic Stations and Sections (April-June, 1967)
 The numeral in parentheses indicates the number of the table containing the
 data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1967





Map showing oceanographic stations and sections (October~December, 1967).
The numeral in parentheses indicates the number of the table containing the data taken at that point.



Map showing oceanographic stations and sections (January~March, 1968).
The numerals in parentheses indicates the number of the table containing the data taken at that point

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1968

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SURVEY OF SEA STRAIT DATA AROUND JAPAN. CRUISE TRACKS BY JAPANE--ETC(U)

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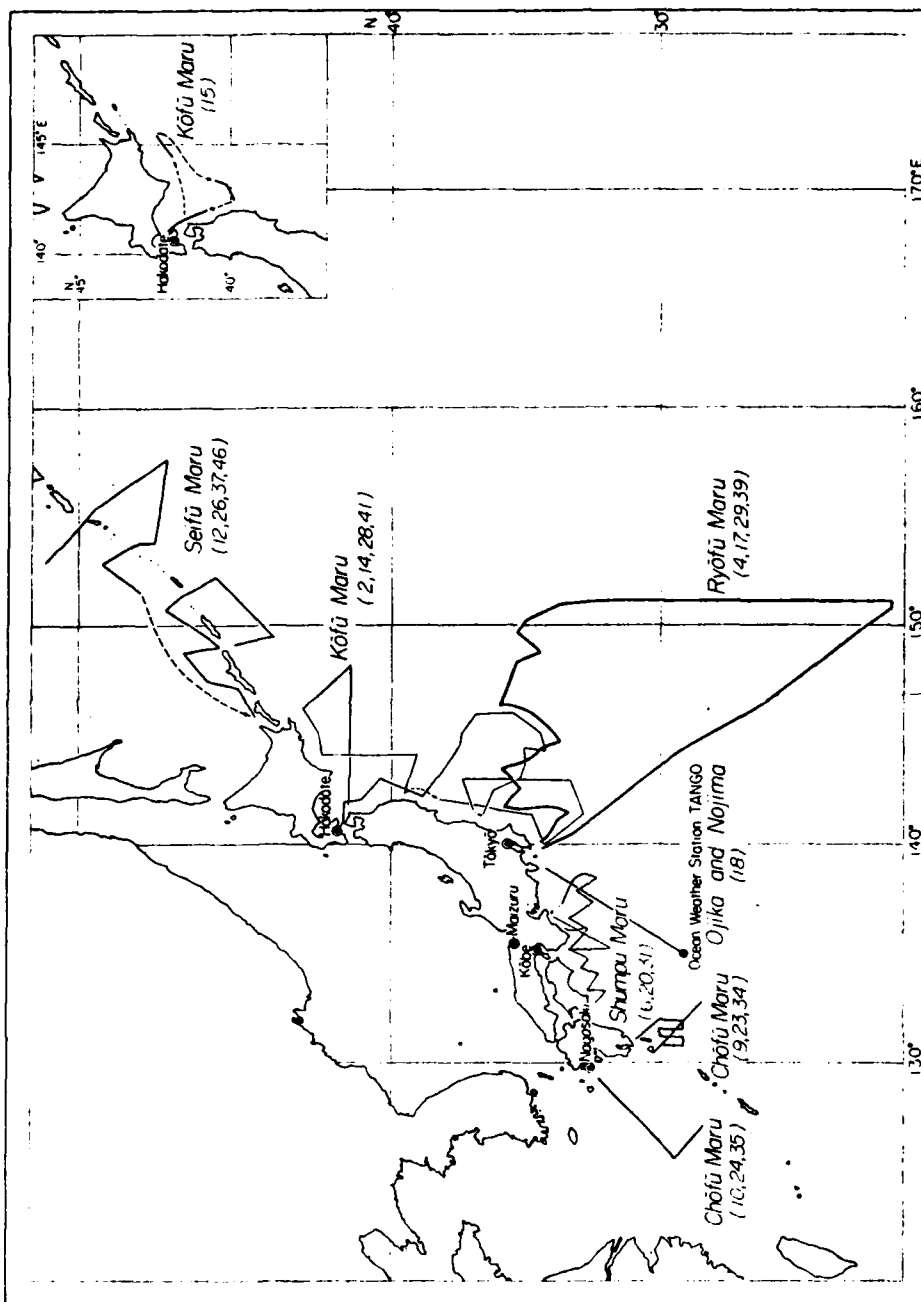
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DATE

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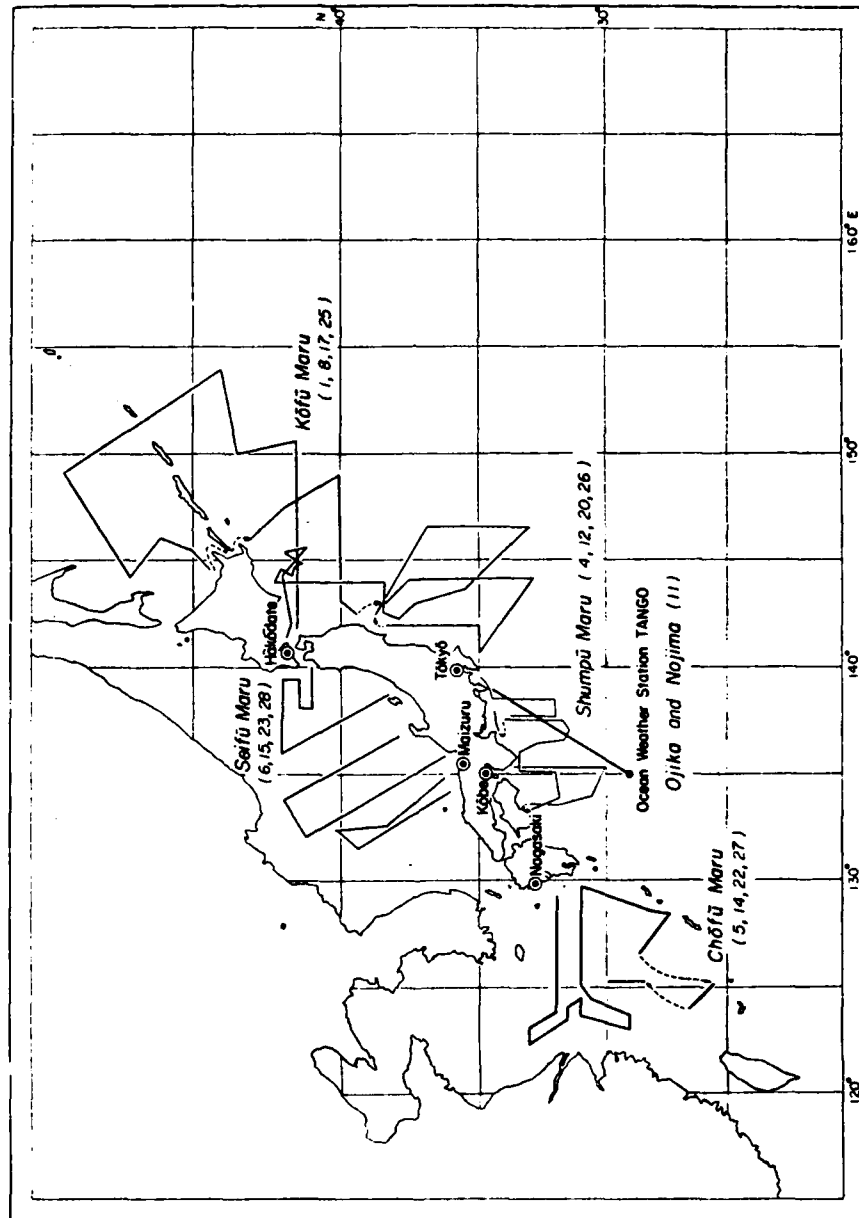
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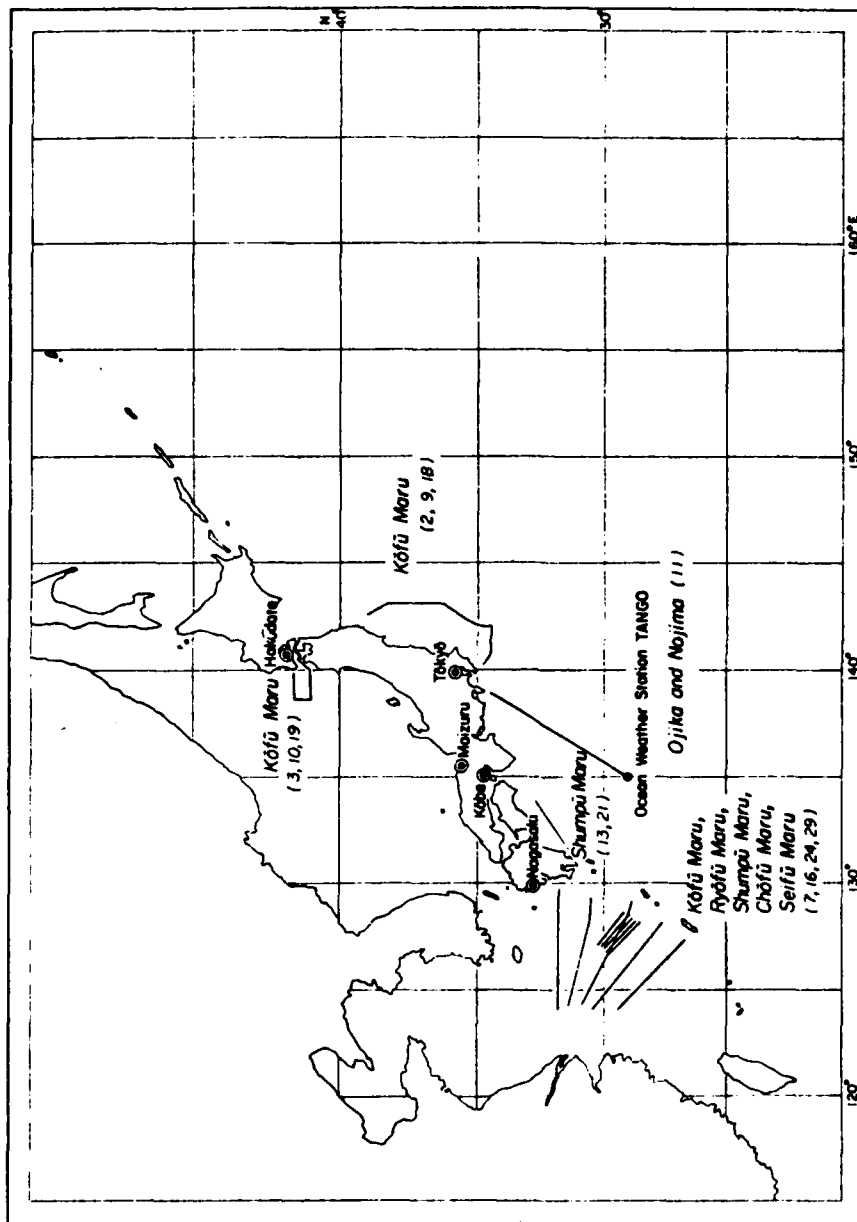
Map showing oceanographic stations and sections (April-June, 1968).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1968



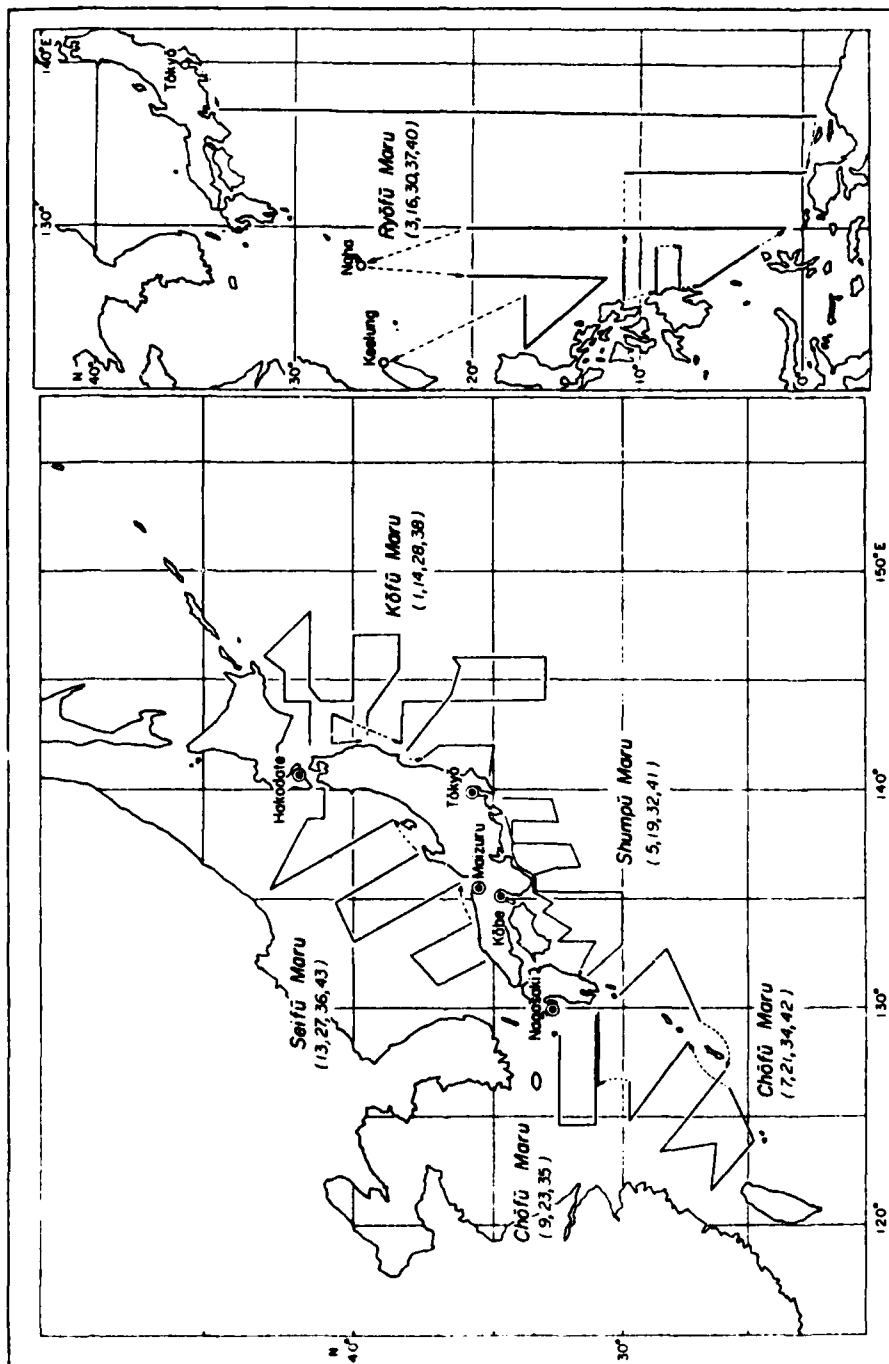
Map showing oceanographic stations and sections (July~September, 1968).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1968



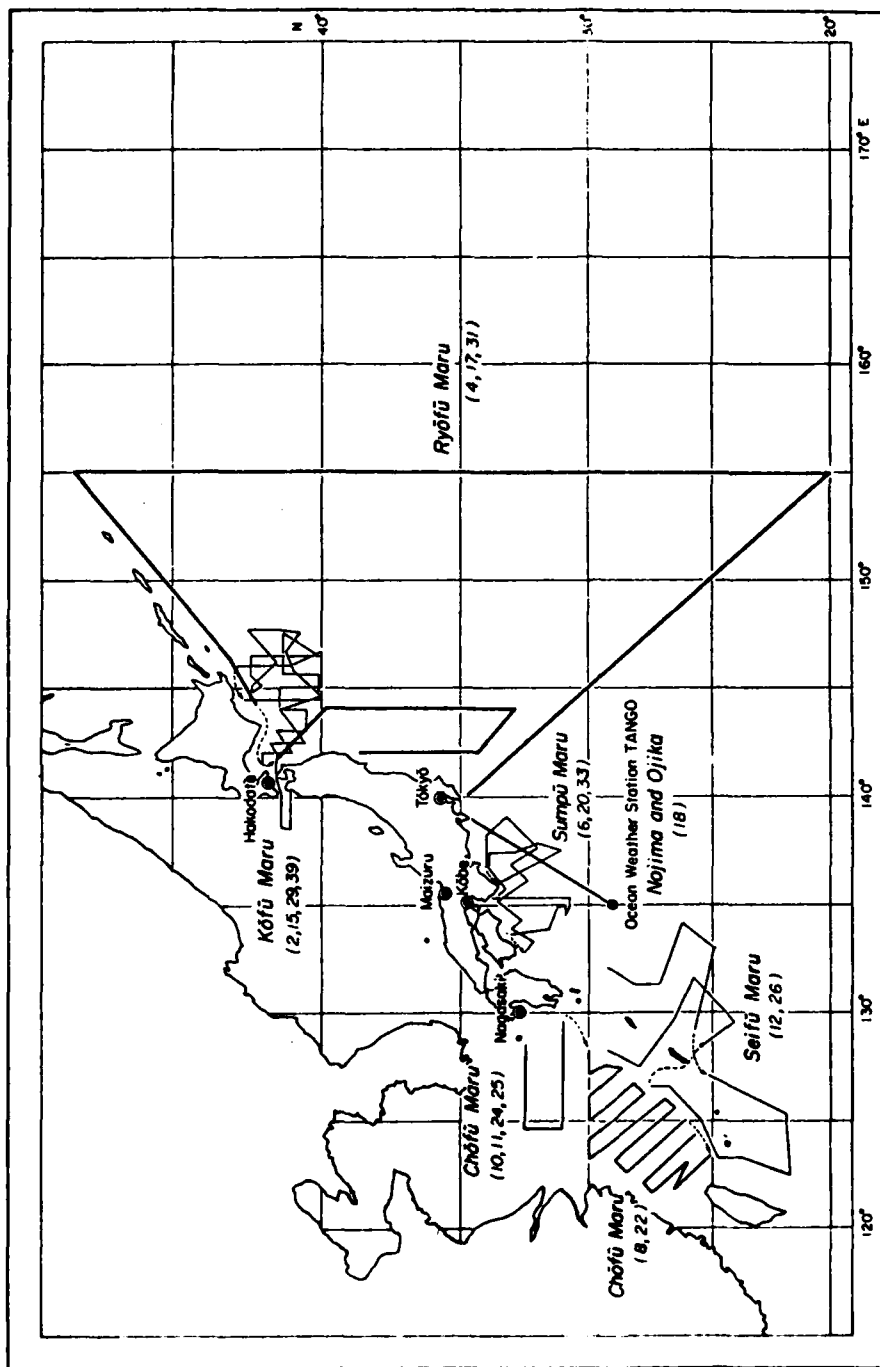
Map showing oceanographic stations and sections (October~December, 1968).
 The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1968



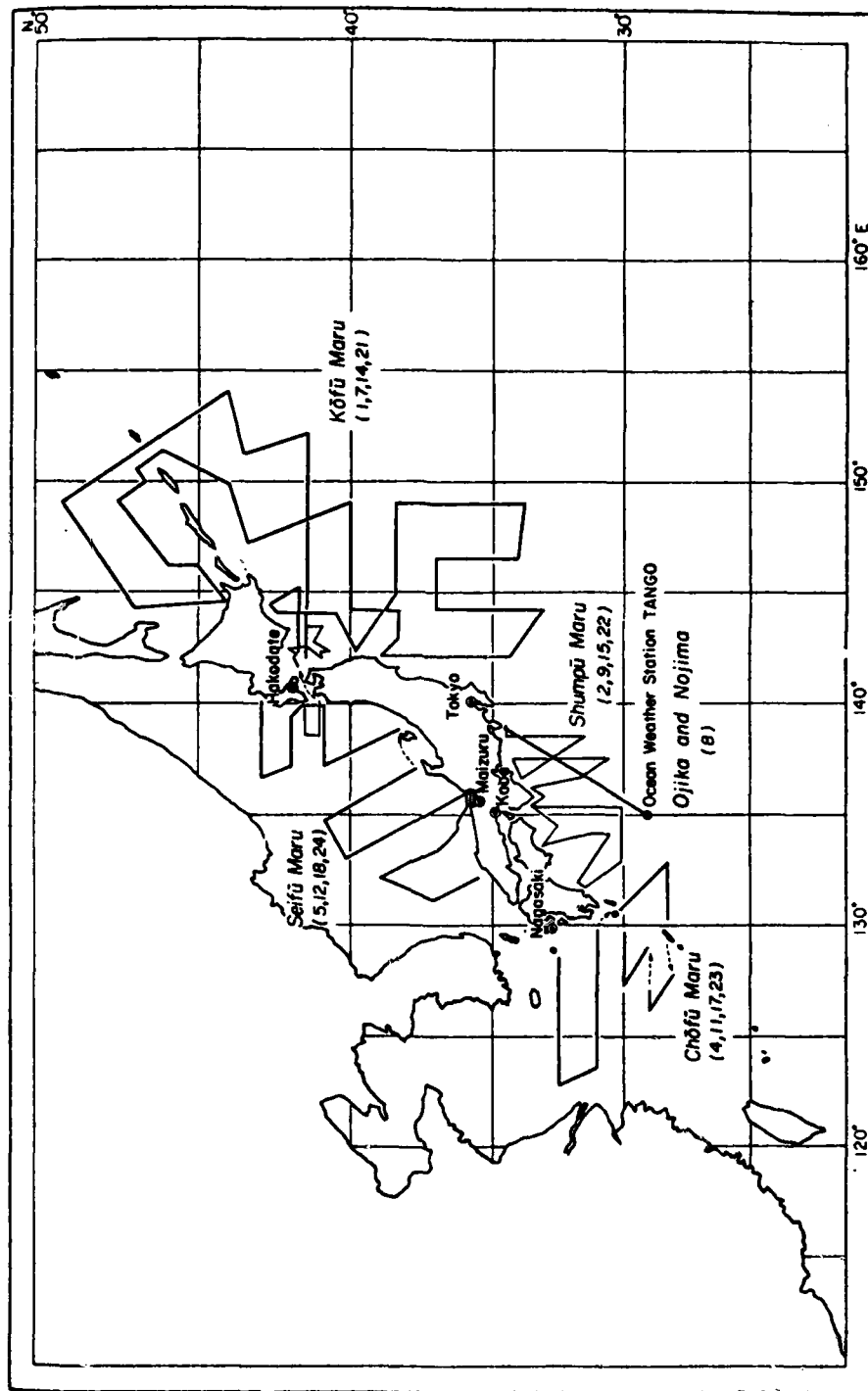
Map showing the Oceanographic Stations and Sections. (January~March, 1969)
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1969

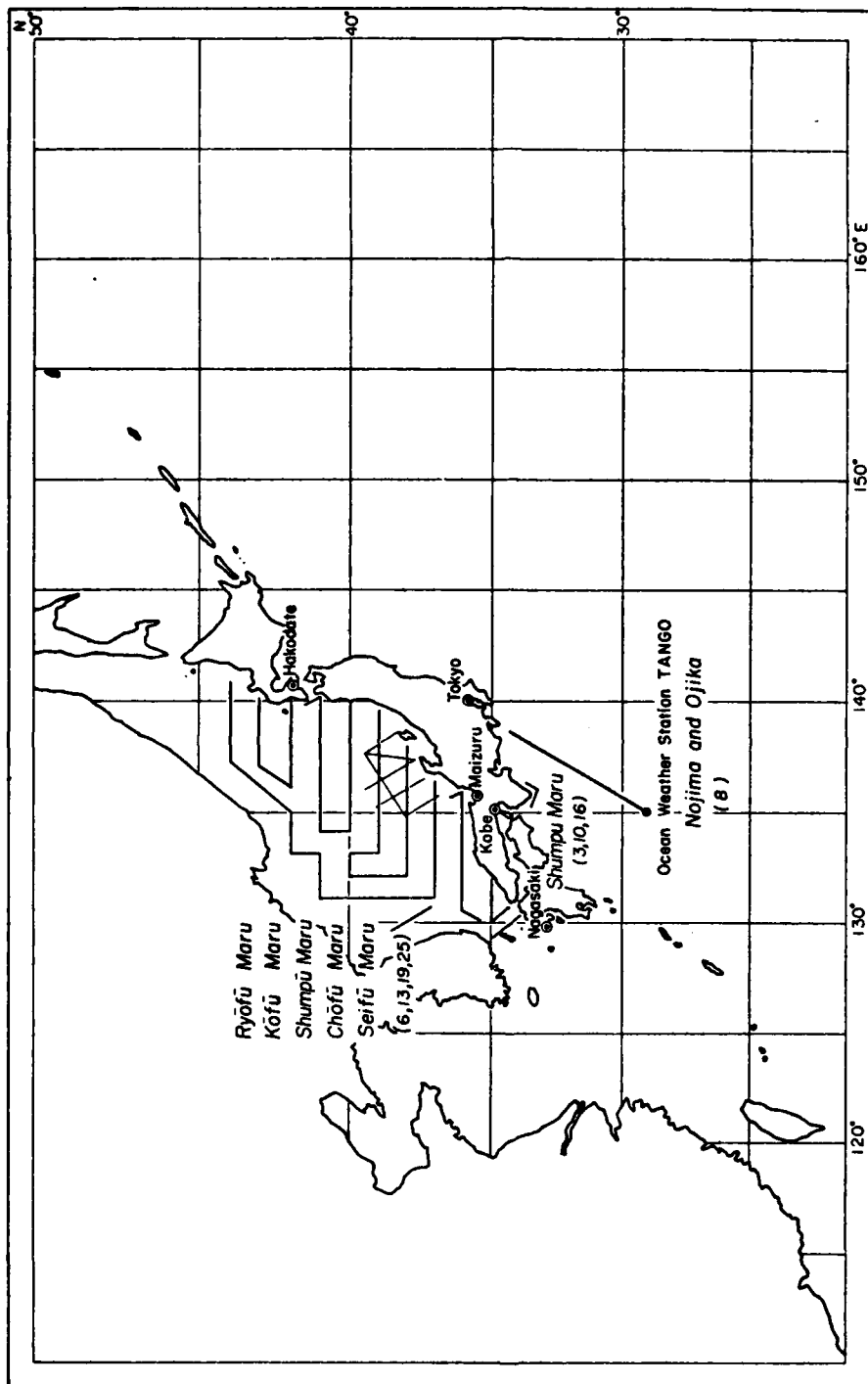


Map showing the Oceanographic Stations and Sections. (April-June, 1969)
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1969

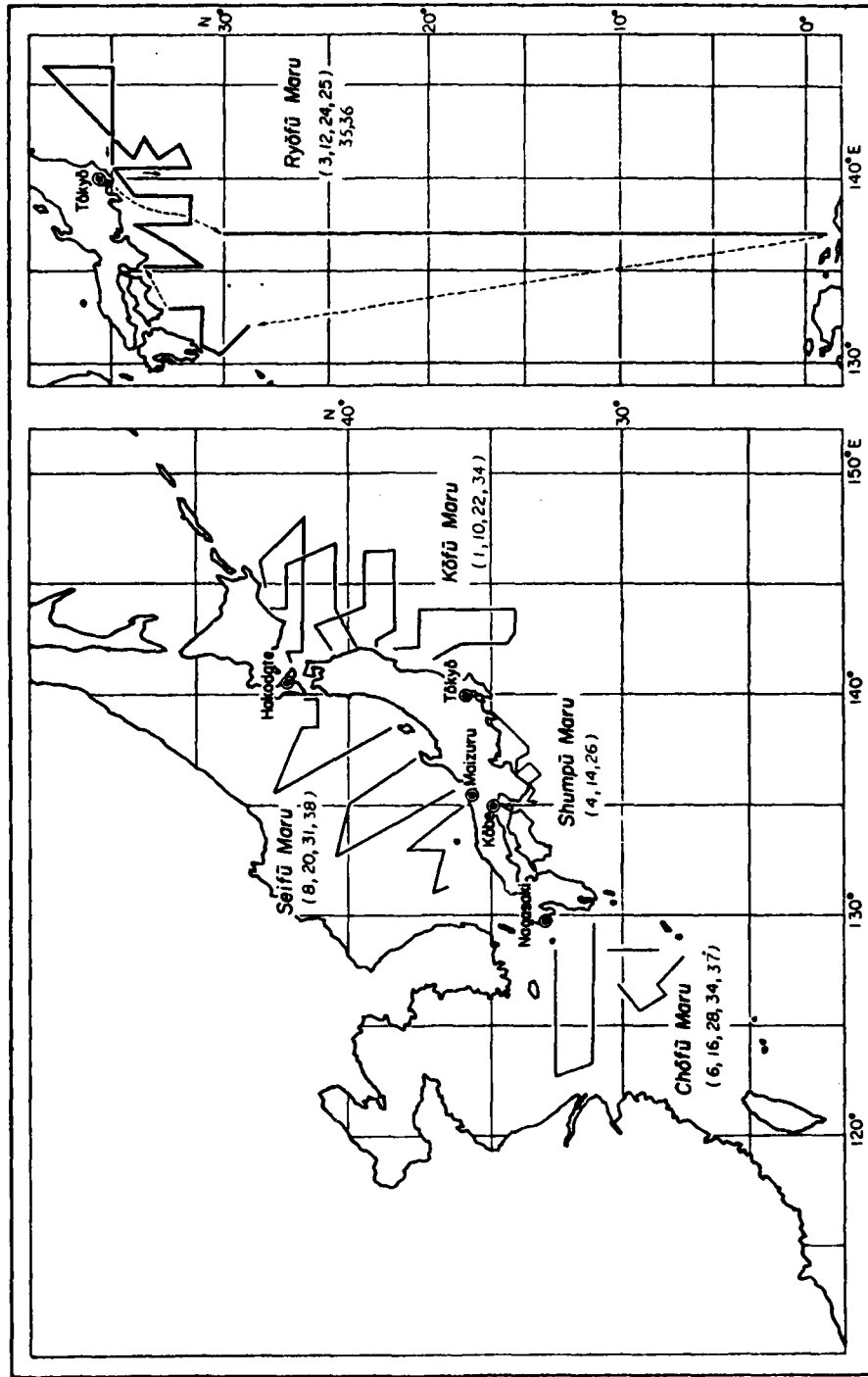


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1969

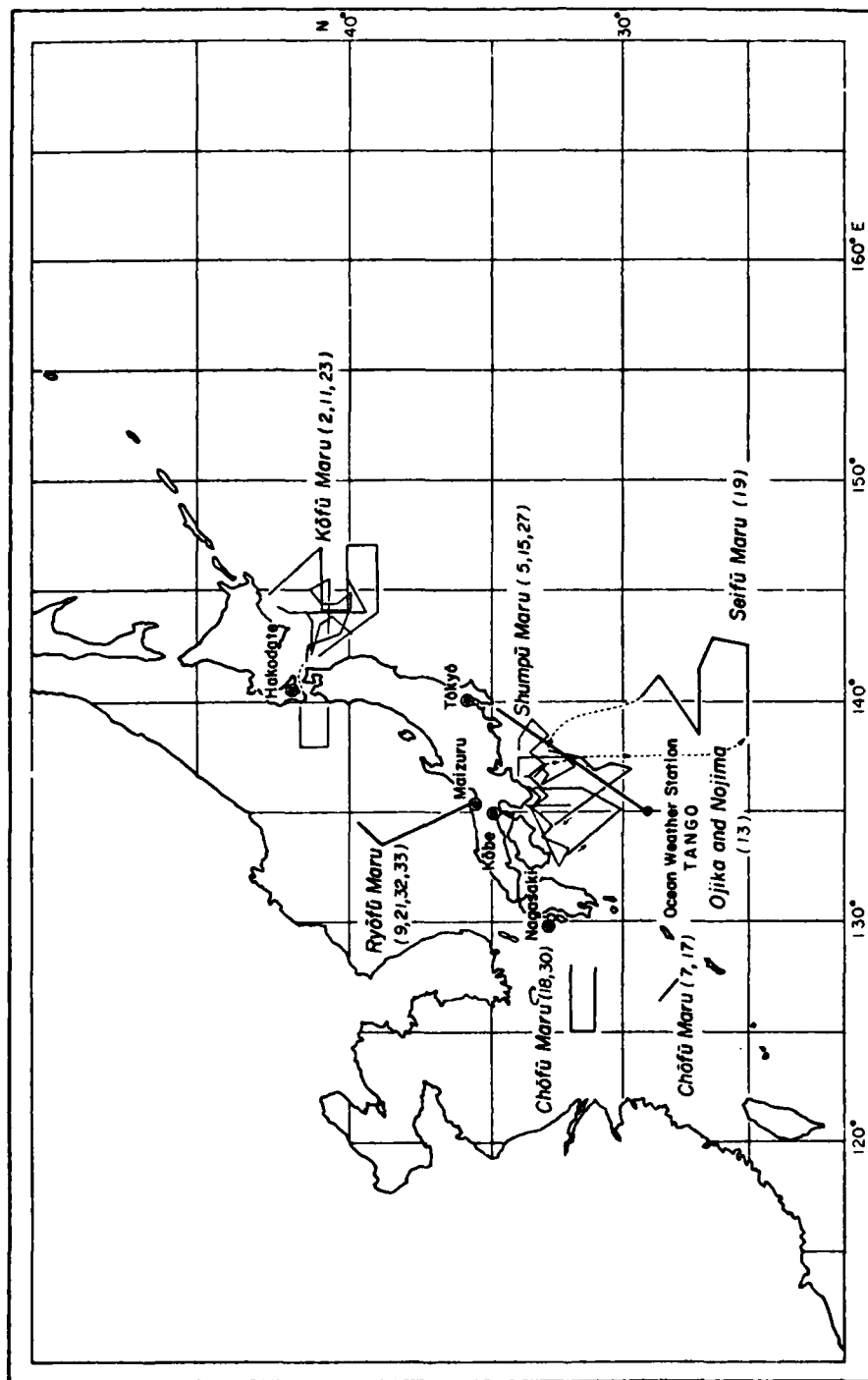


Map showing the Oceanographic Stations and Sections. (October~December, 1969)
 The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1969

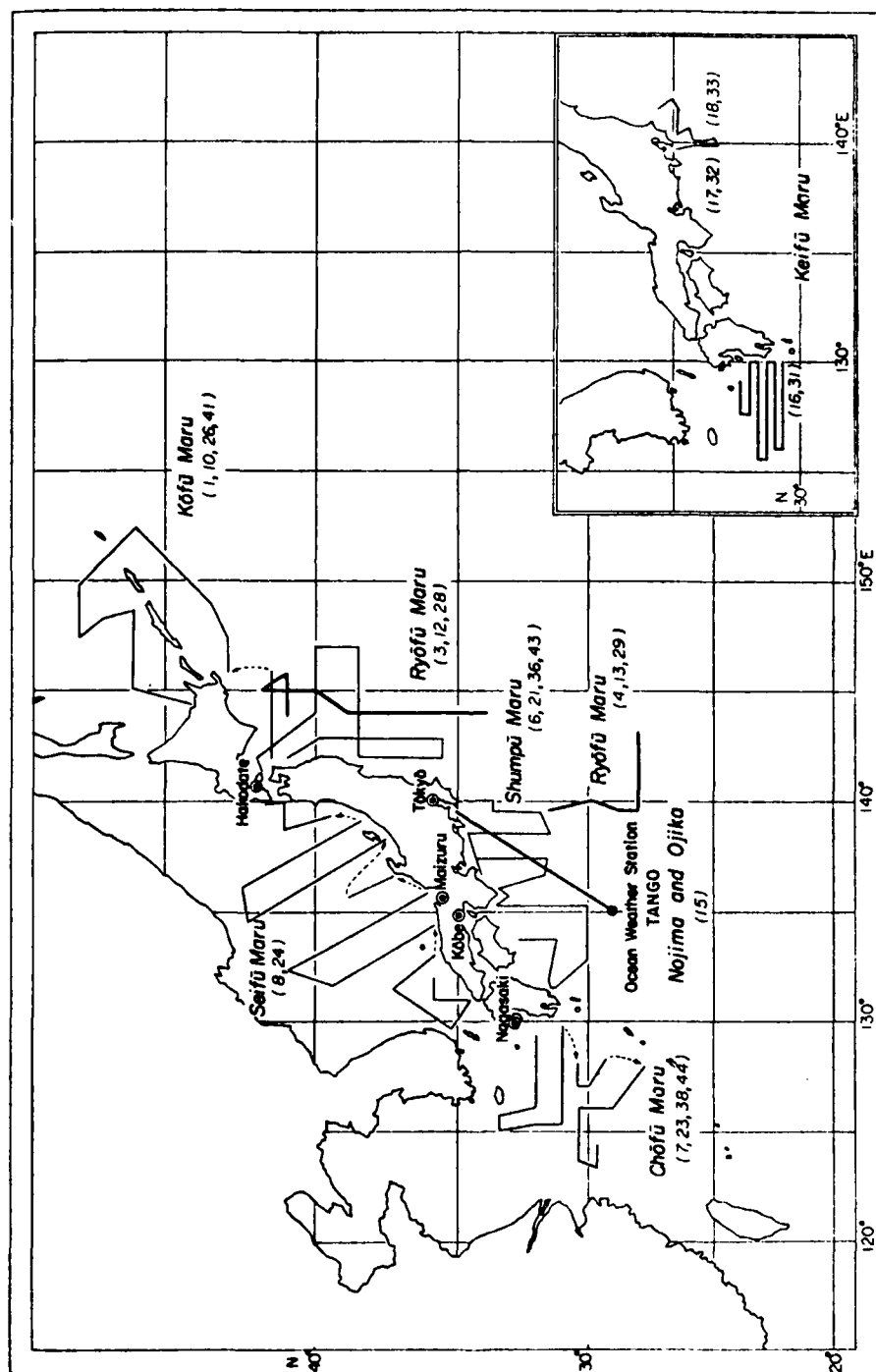


Map showing oceanographic stations and sections (January~March, 1970).
 The numeral in parentheses indicates the number of the table containing the data taken at that point.



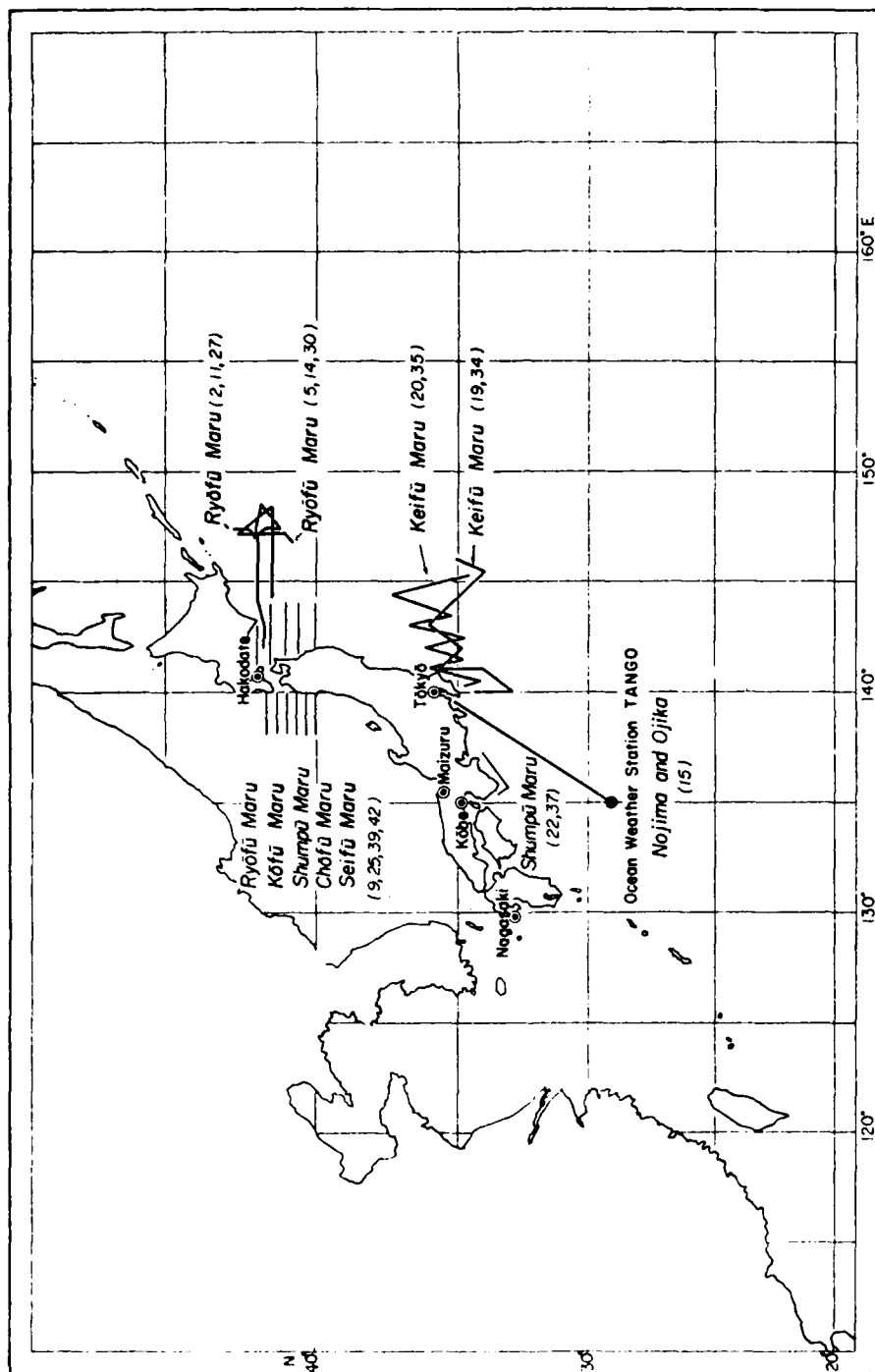
Map showing oceanographic stations and sections (April~June, 1970).
The numeral in parentheses indicates the number of the table containing the data taken at that point.

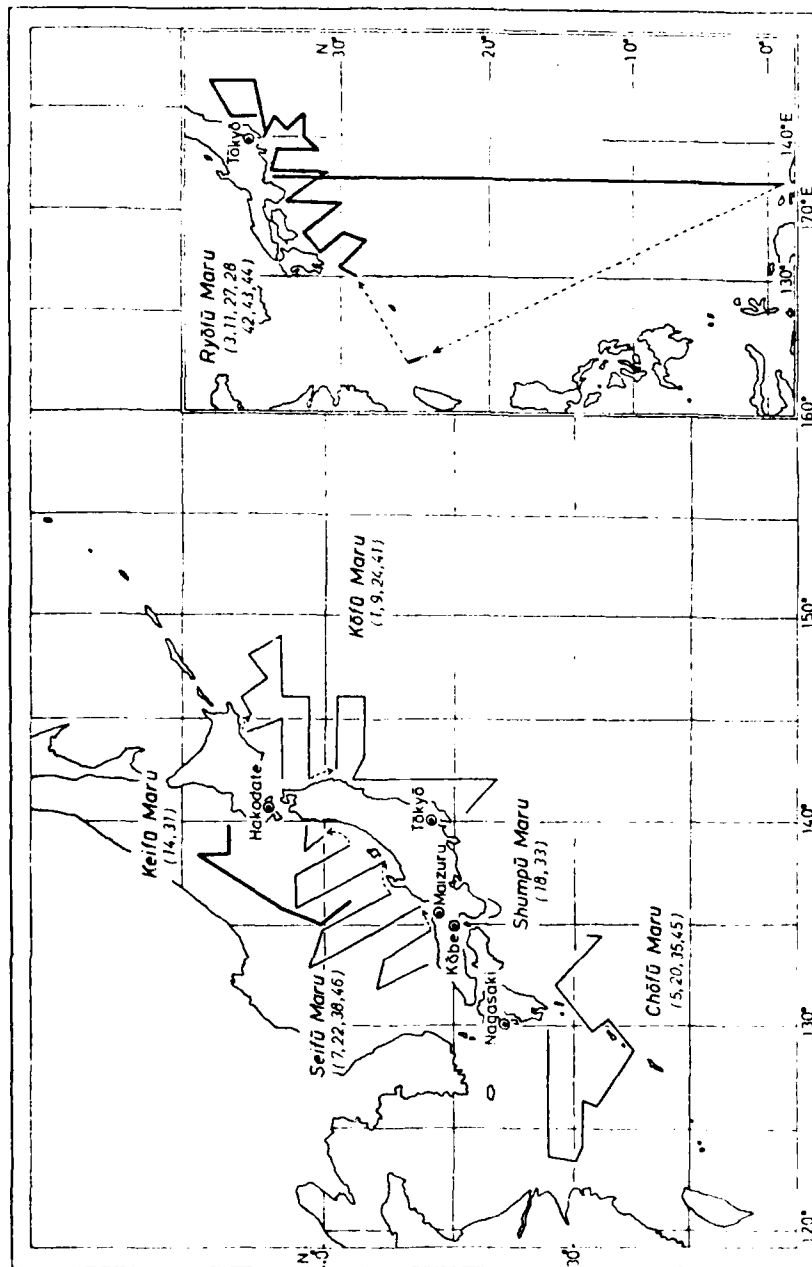
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1970



Map showing oceanographic stations and sections (July ~Sept, 1970).
 The numerals in parentheses indicates the number of the table containing the data taken at that point.

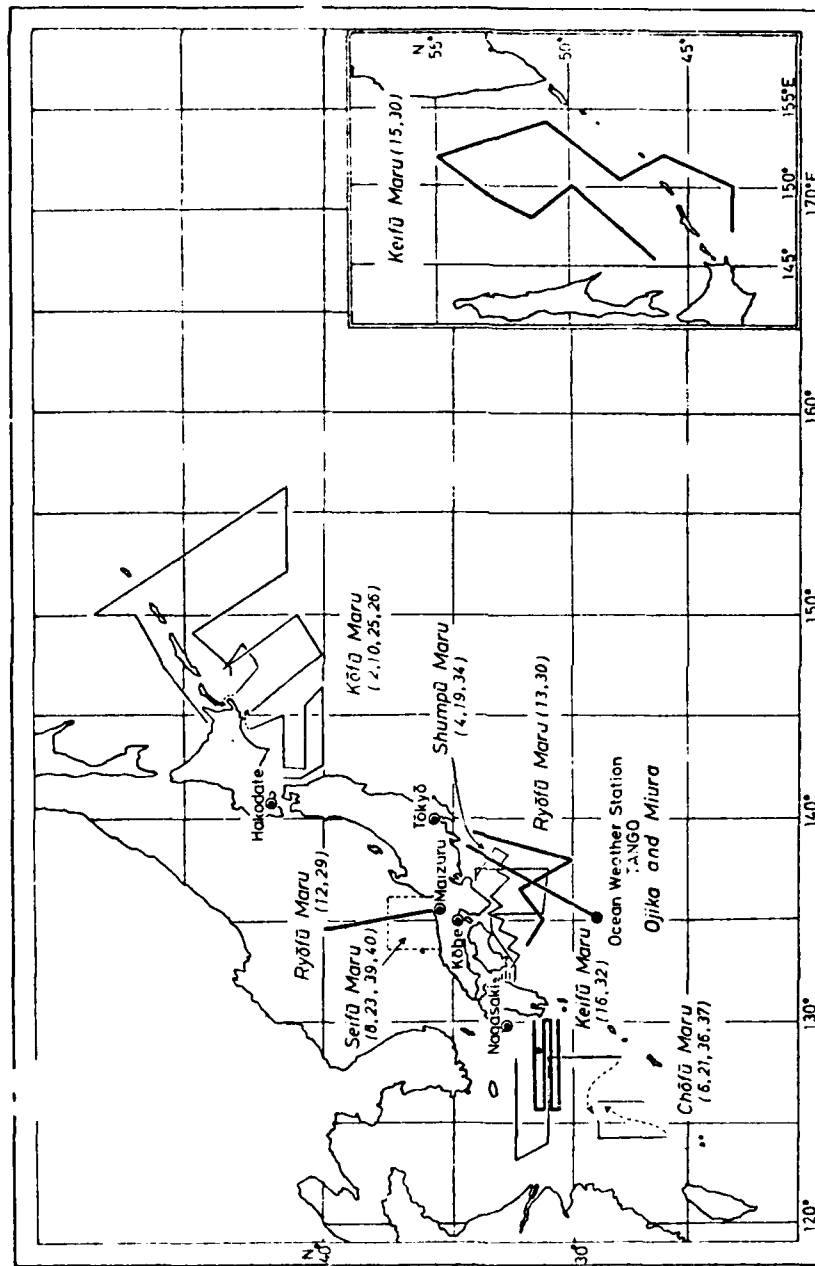
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1970





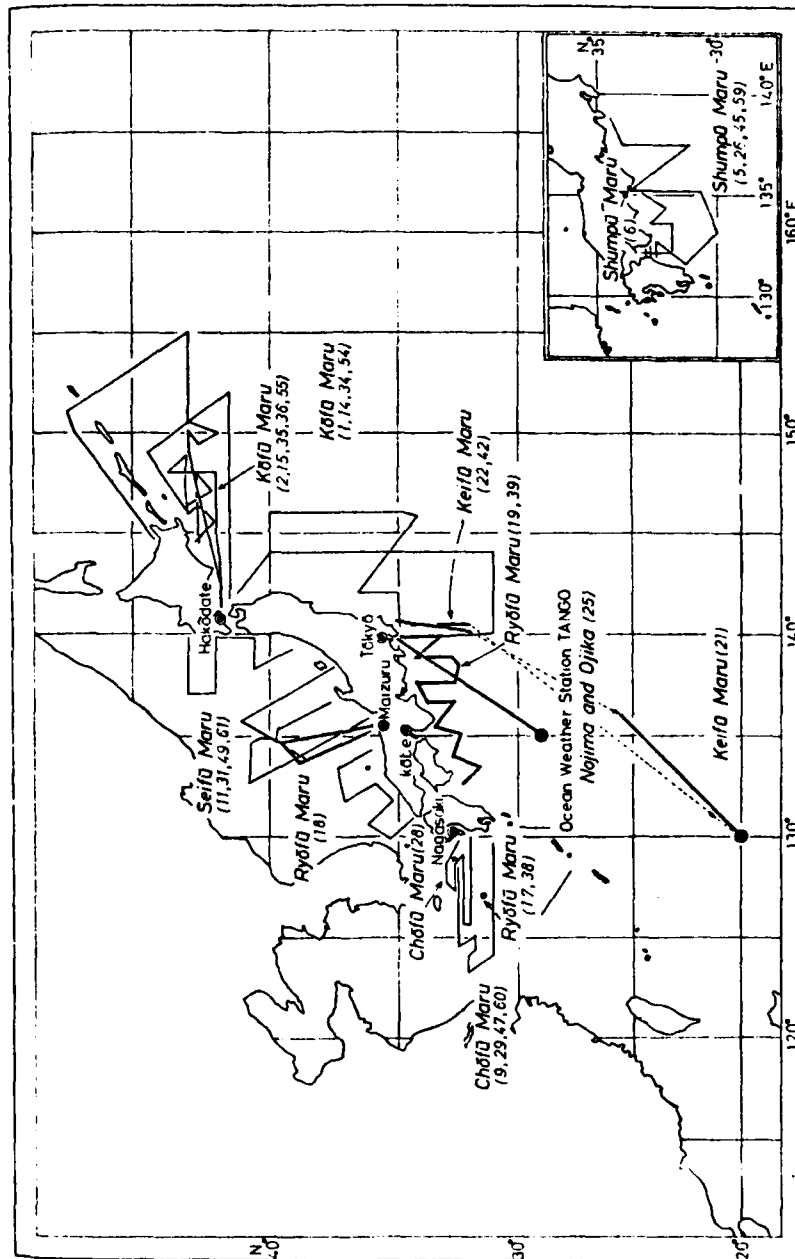
Map showing oceanographic stations and sections (January-March, 1971).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1971



Map showing oceanographic stations and sections (April-June, 1971).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1971

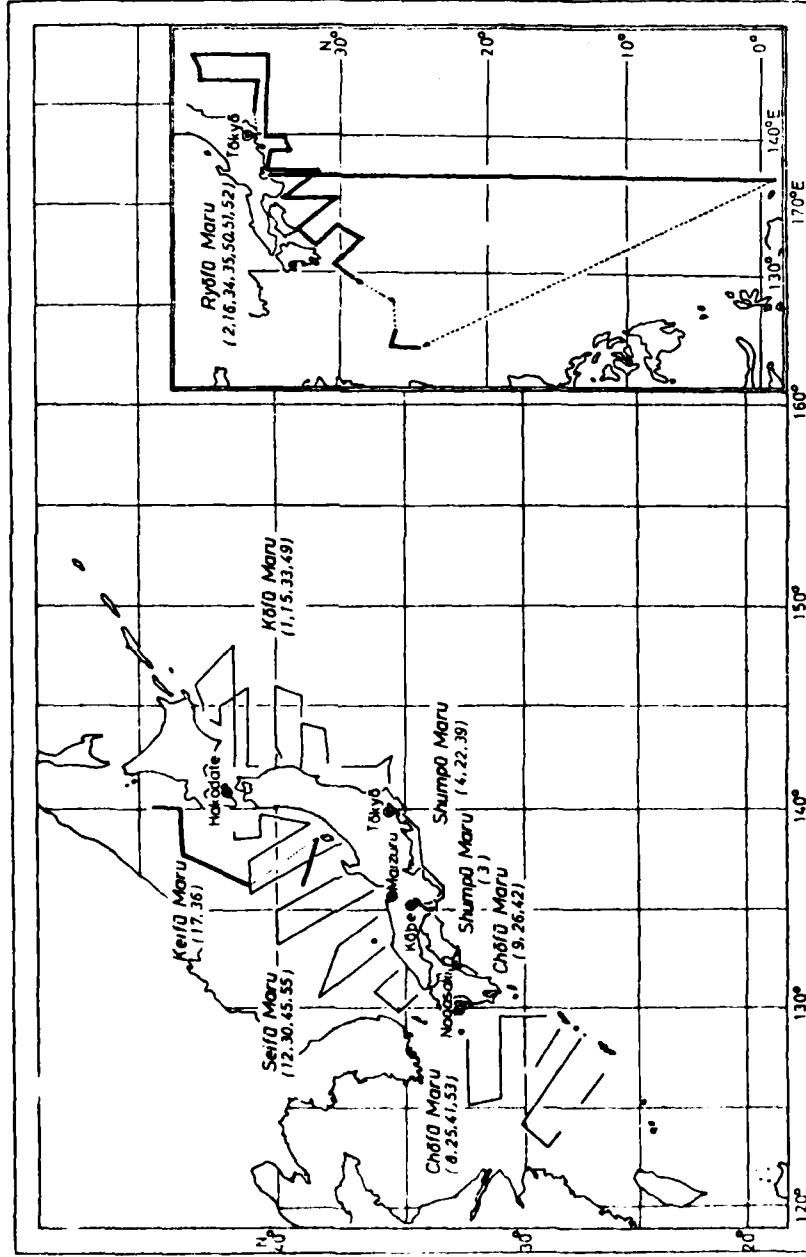


Map showing oceanographic stations and sections (July~Sept., 1971).
 The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1971

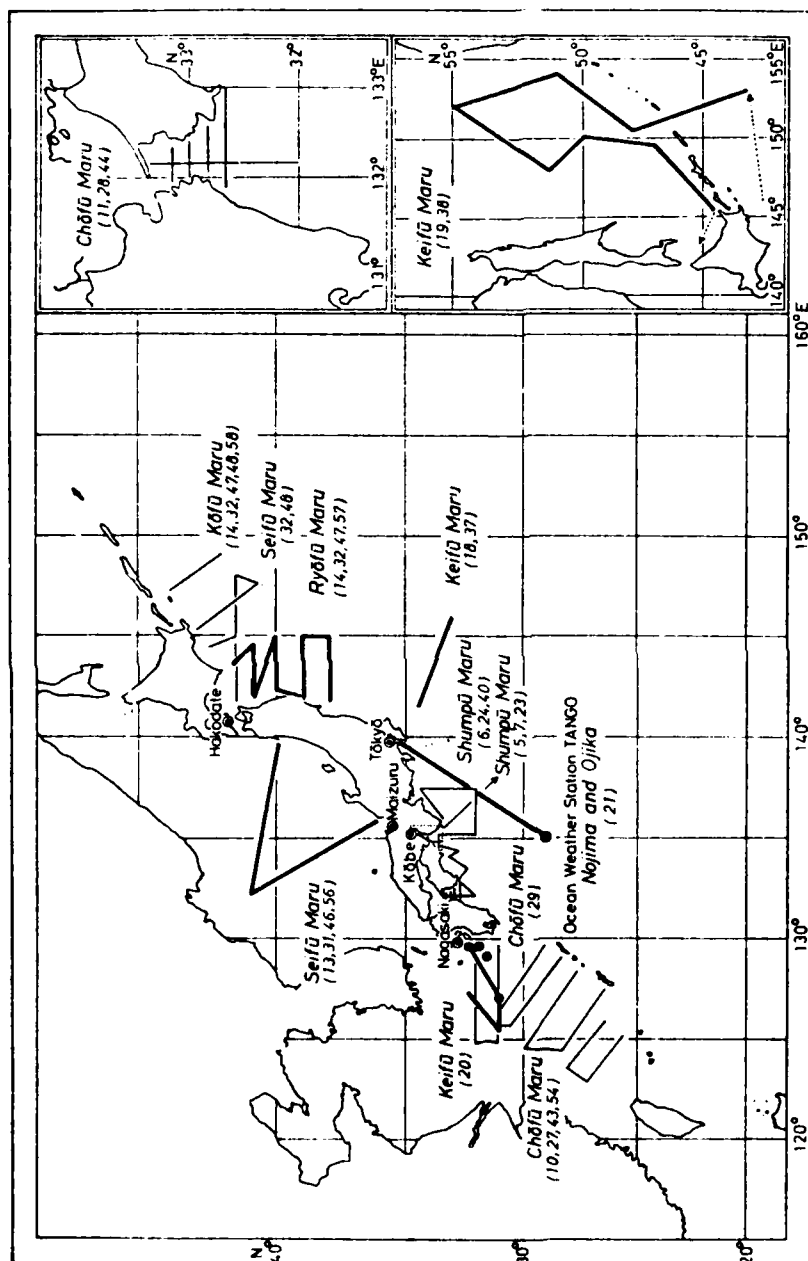


CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1971



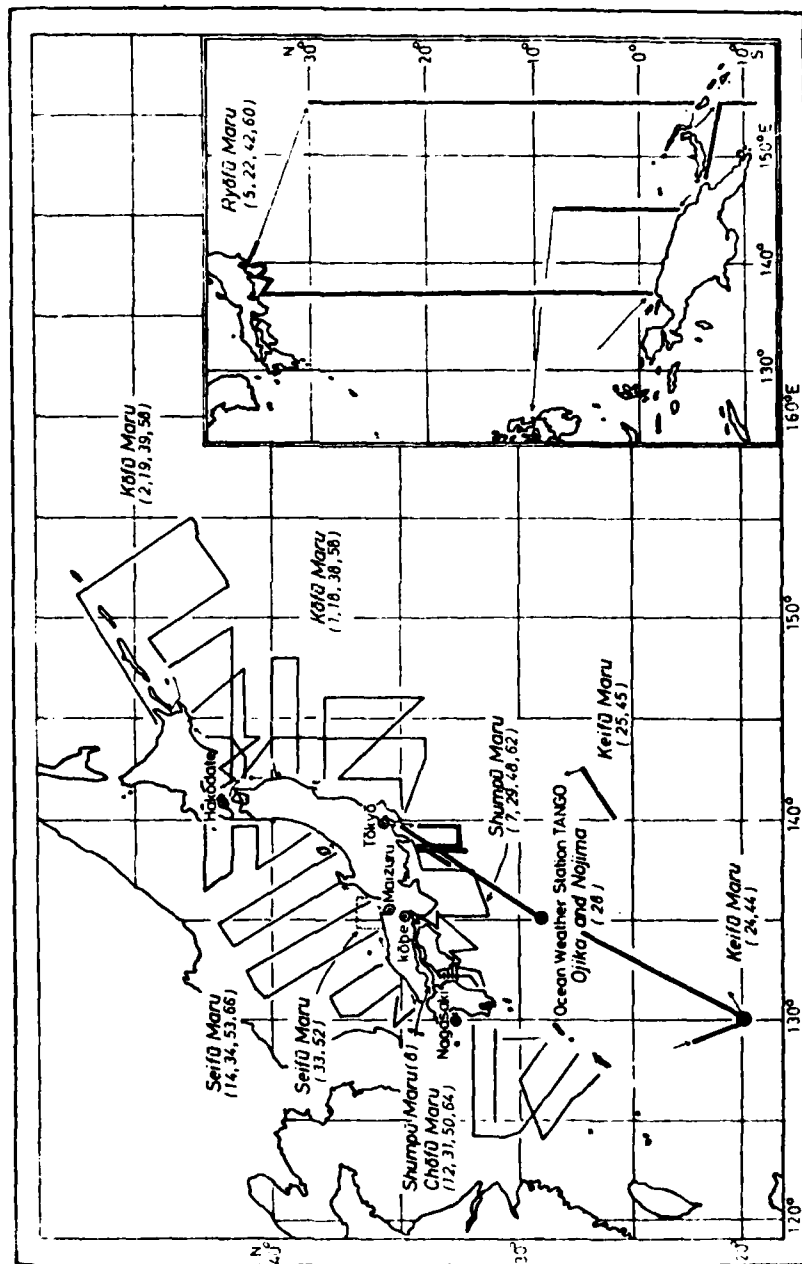
Map showing oceanographic stations and sections (Jan.-Mar., 1972).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

CRUISE TRACKS AND SECTIONS, WESTERN PACIFIC OCEAN, YEAR 1972

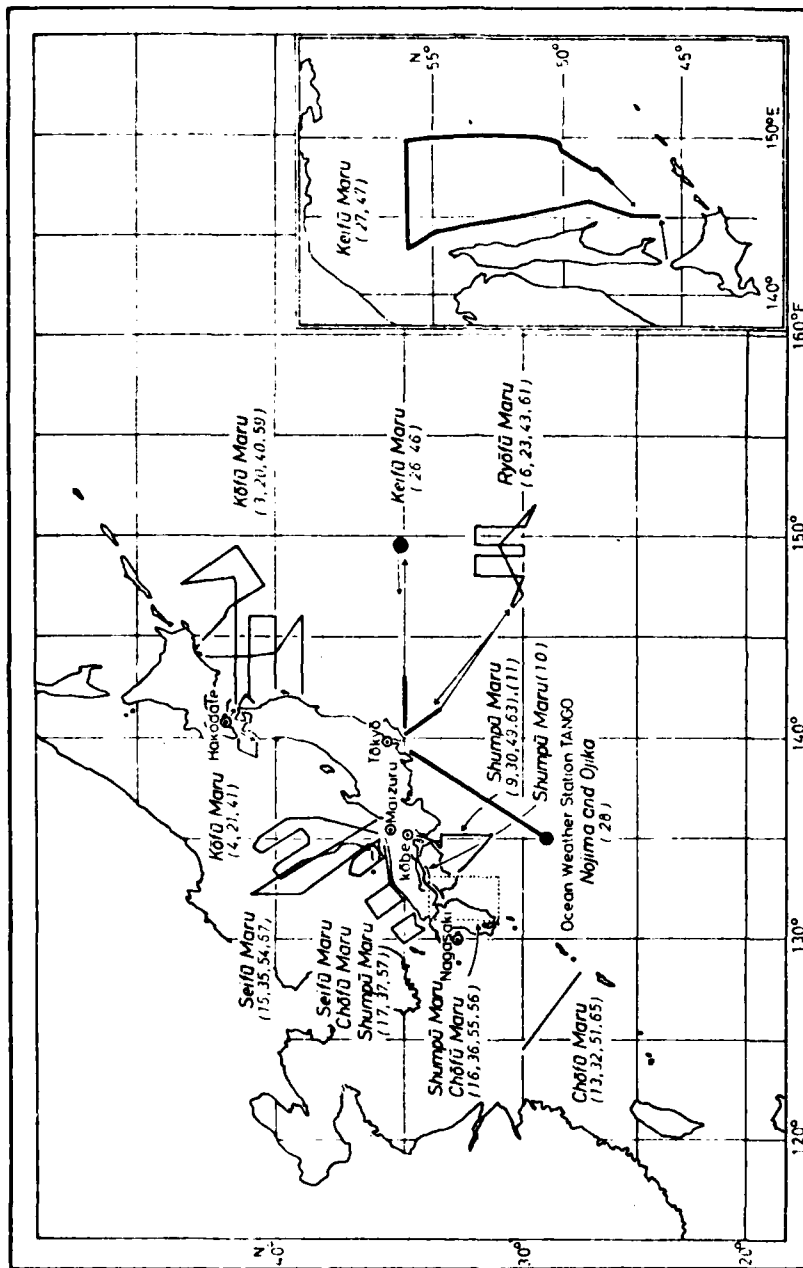


Map showing oceanographic stations and sections (Apr.~June, 1972).
The numerals in parentheses indicates the number of the table containing the data taken at
that point.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1972

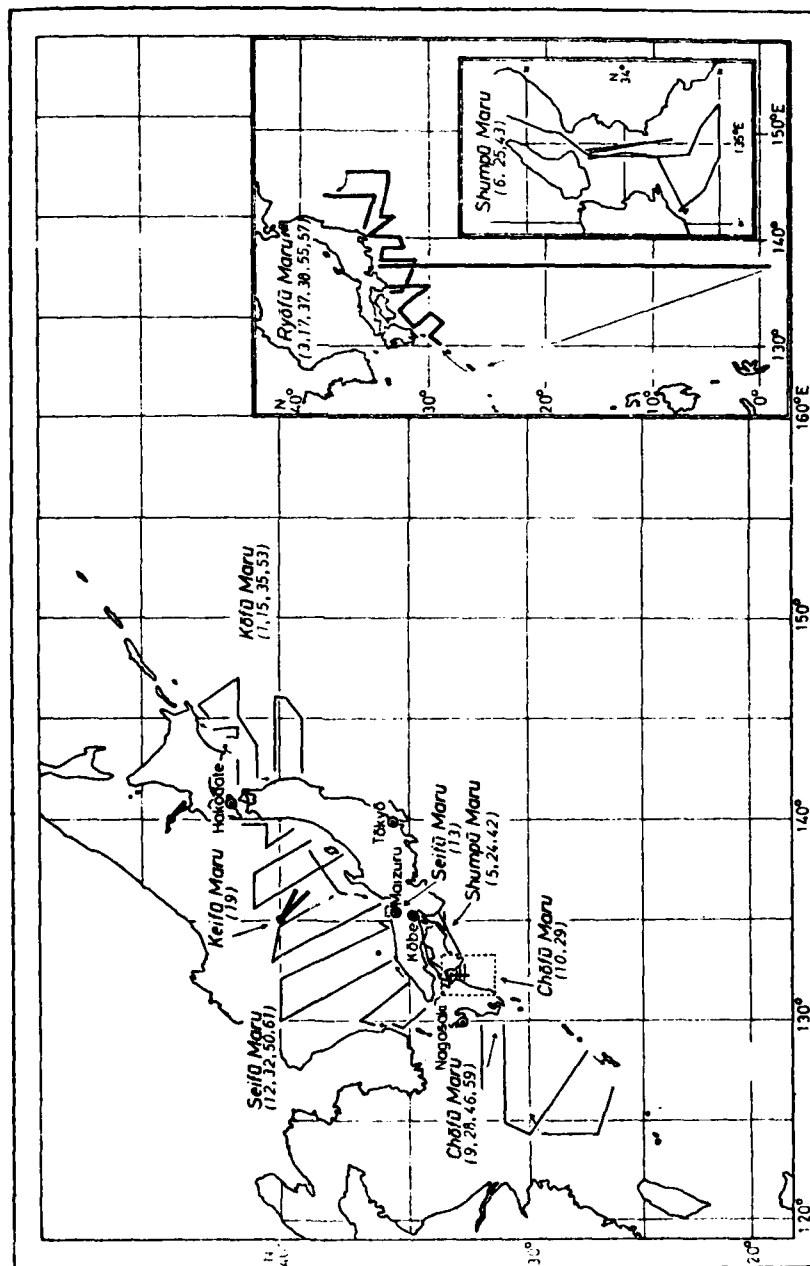


Map showing oceanographic stations and sections (July-Sept., 1972).
The numerals in parentheses indicate the number of the table containing the data taken at that point.



Map showing oceanographic stations and sections (Oct.~Dec., 1972).
The numerals in parentheses indicates the number of the table containing the data taken at that point.

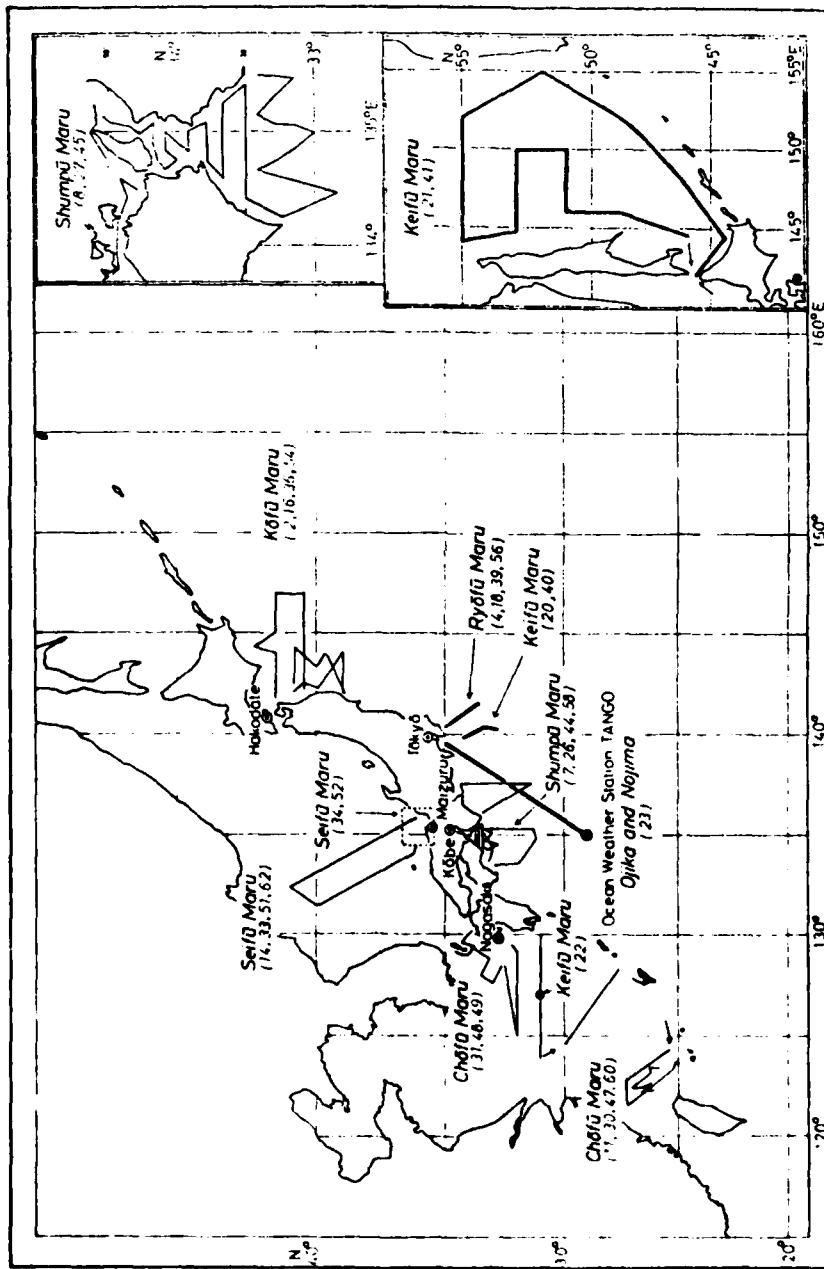
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1972



Station location chart, Jan.—Mar., 1973

The numerals in parentheses indicate the table numbers.

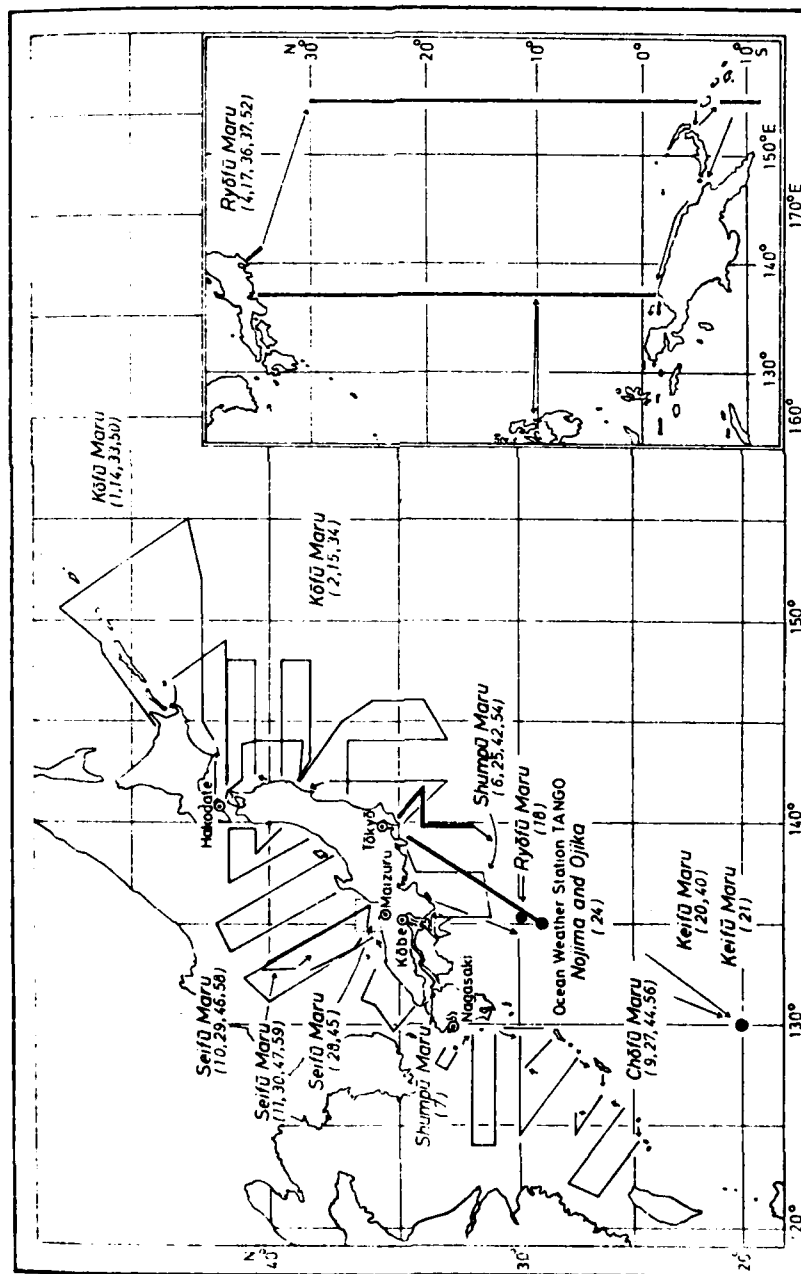
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1973



Station location chart, Apr.—June, 1973

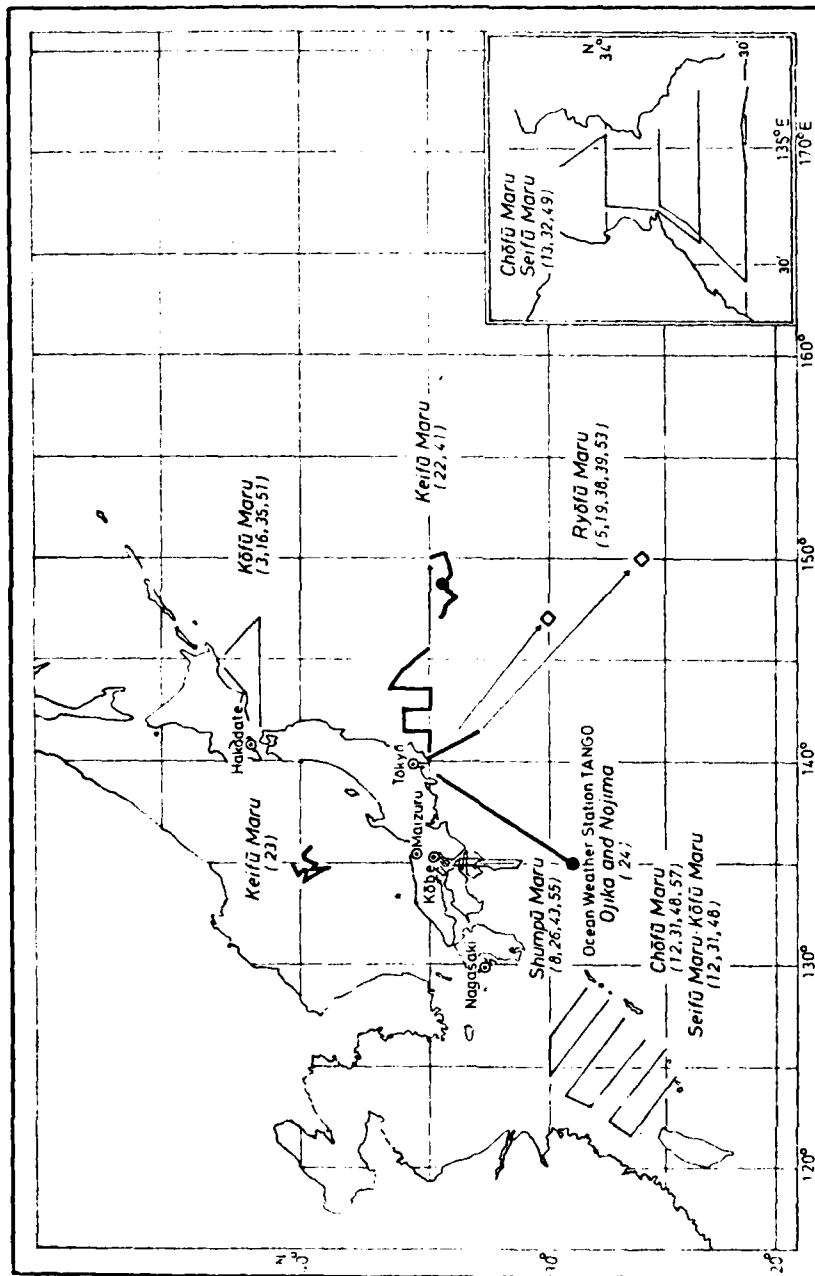
The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1973



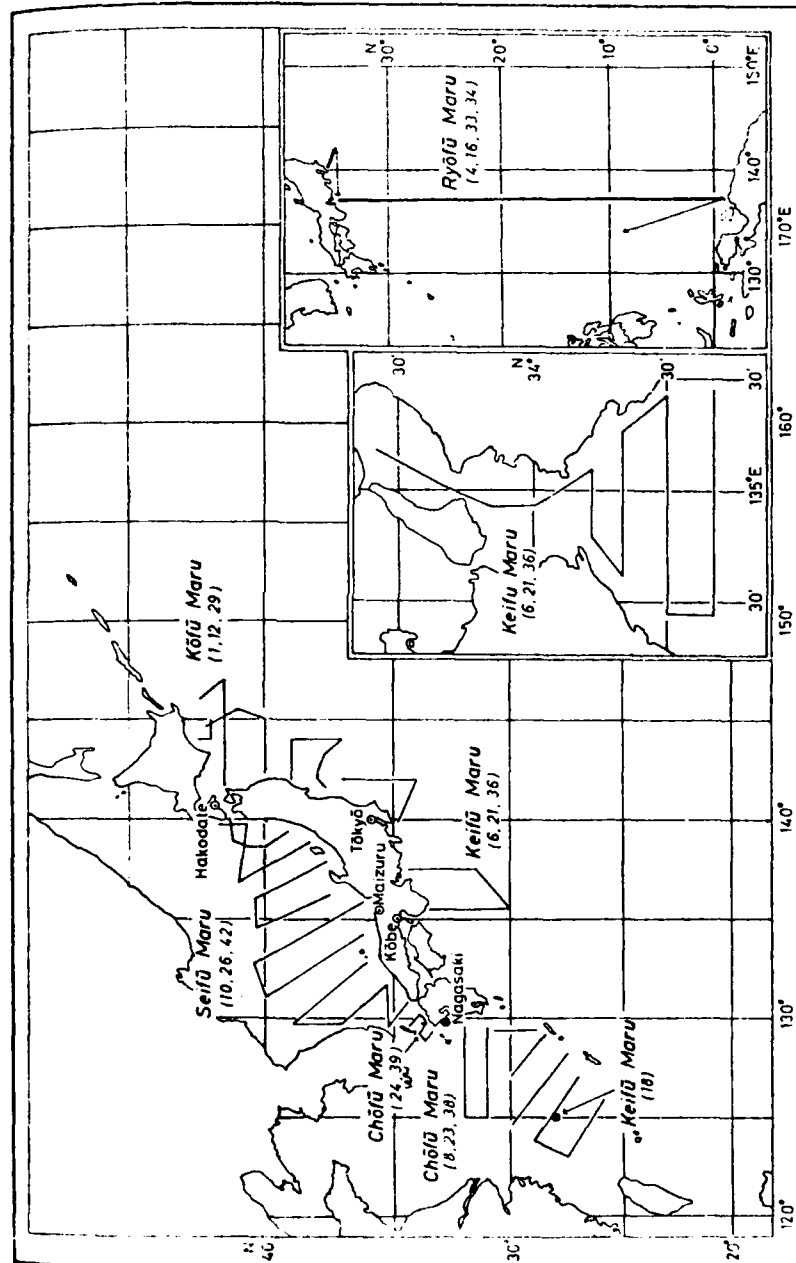
Station location chart, July-Sept., 1973
 The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1973

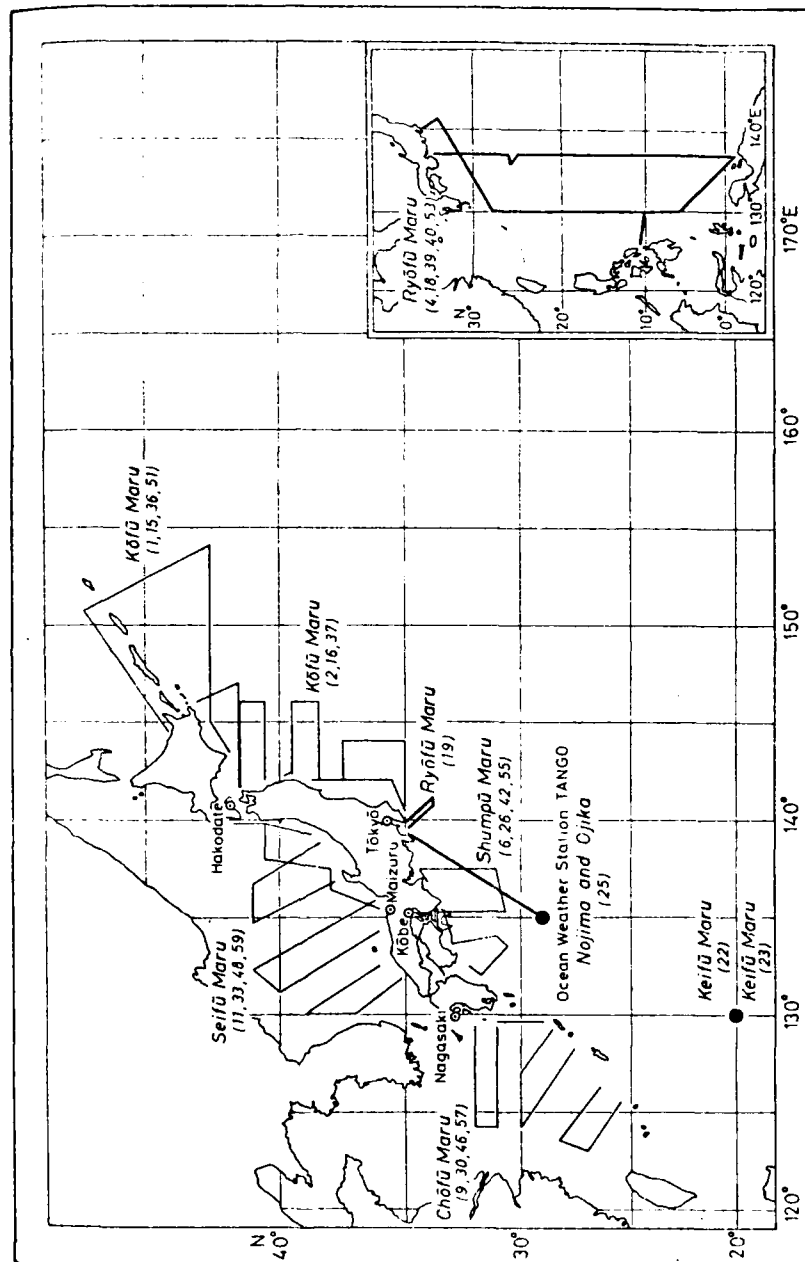


Station location chart, Oct.-Dec., 1973
The numerals in parentheses indicate the table numbers.

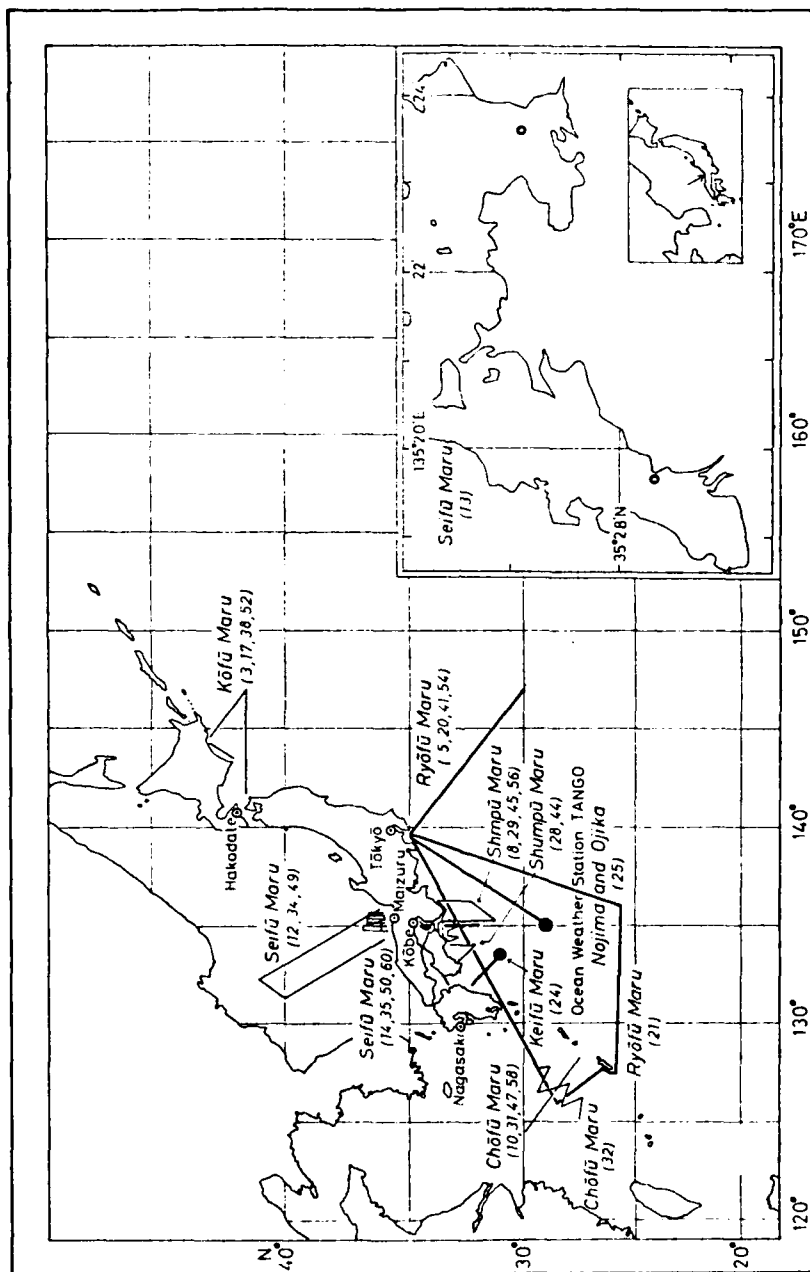
CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1973



Station location chart, Jan.—Mar., 1974
The numerals in parentheses indicate the table numbers.

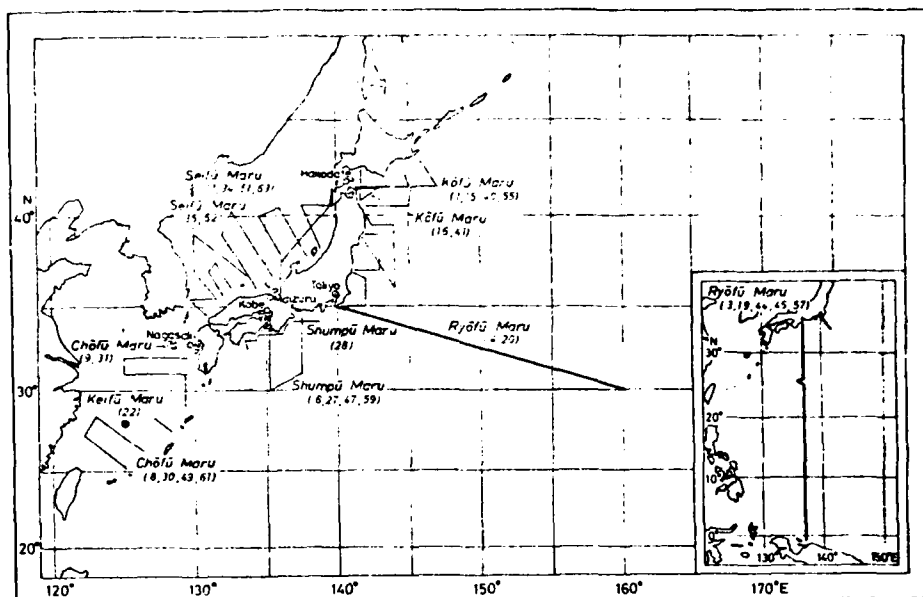


Station location chart July-Sept., 1974
The numerals in parentheses indicate the table numbers

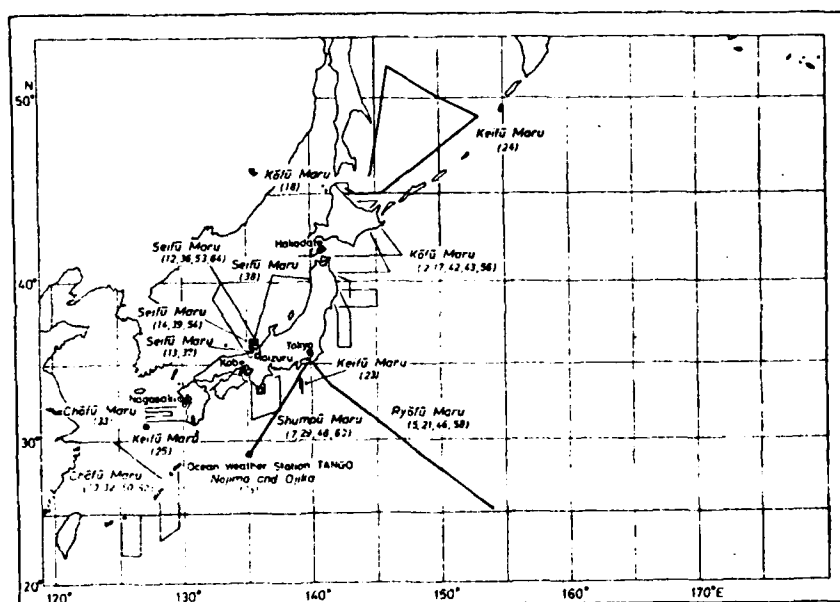


Station location chart Oct.-Dec., 1974
The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1974

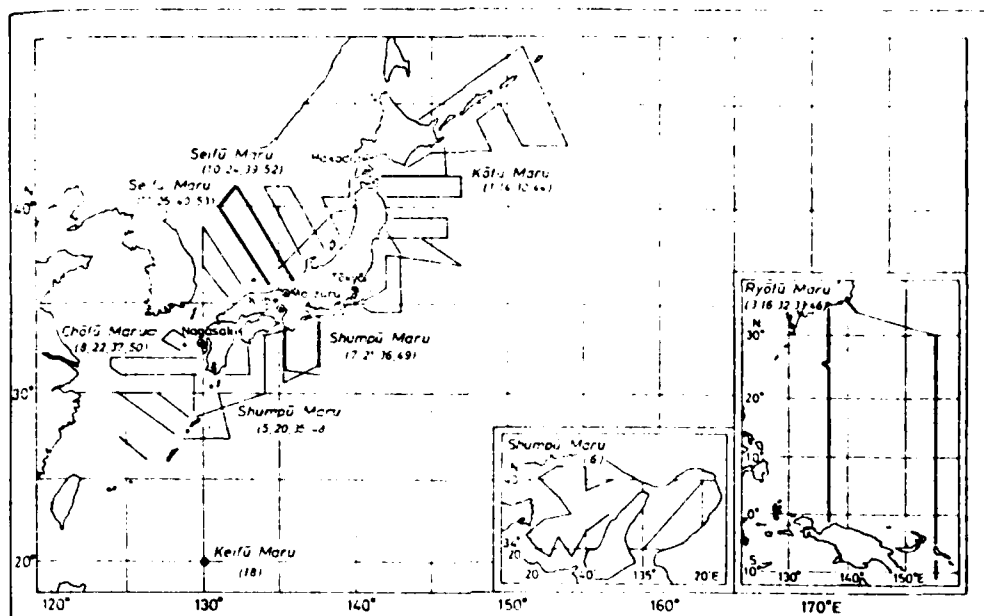


Station location chart, Jan.-Mar., 1975
The numerals in parentheses indicate the table numbers.

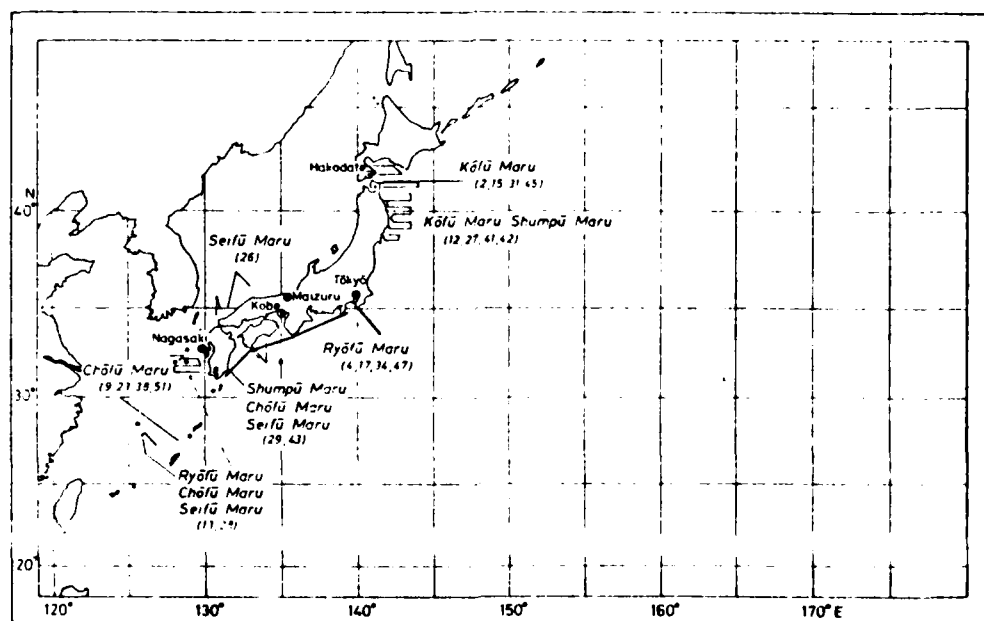


Station location chart, Apr.-June, 1975
The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1975

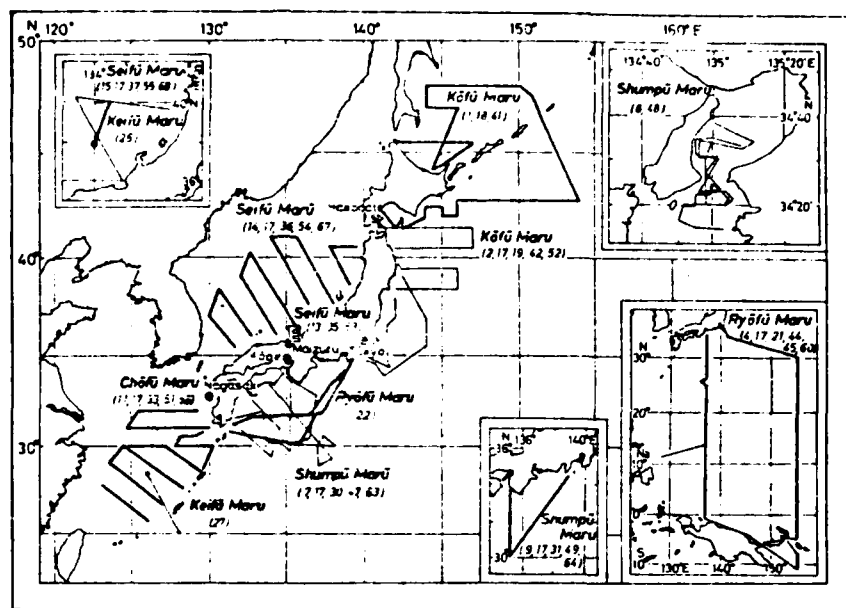


Station location chart, July-Aug., 1975
The numerals in parentheses indicate the table numbers.

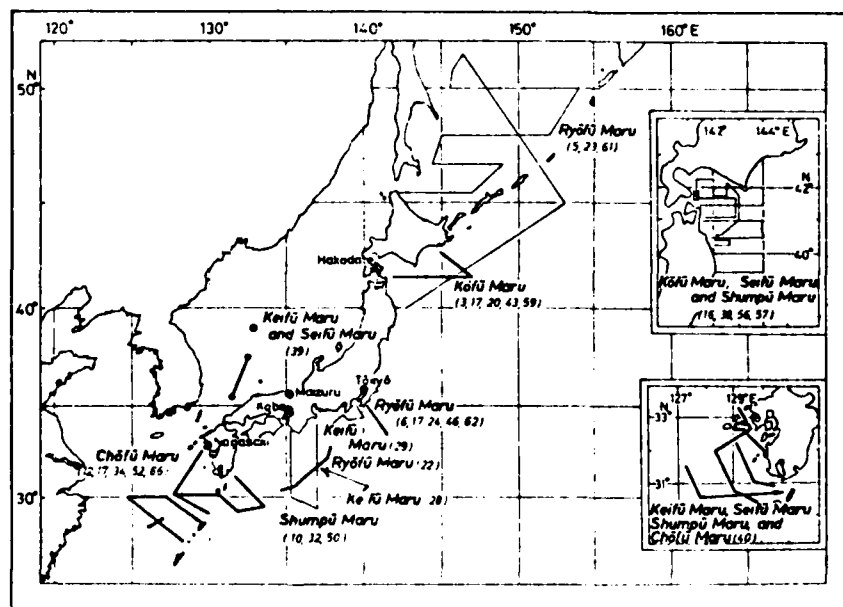


Station location chart, Sept.-Dec., 1975
The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1975

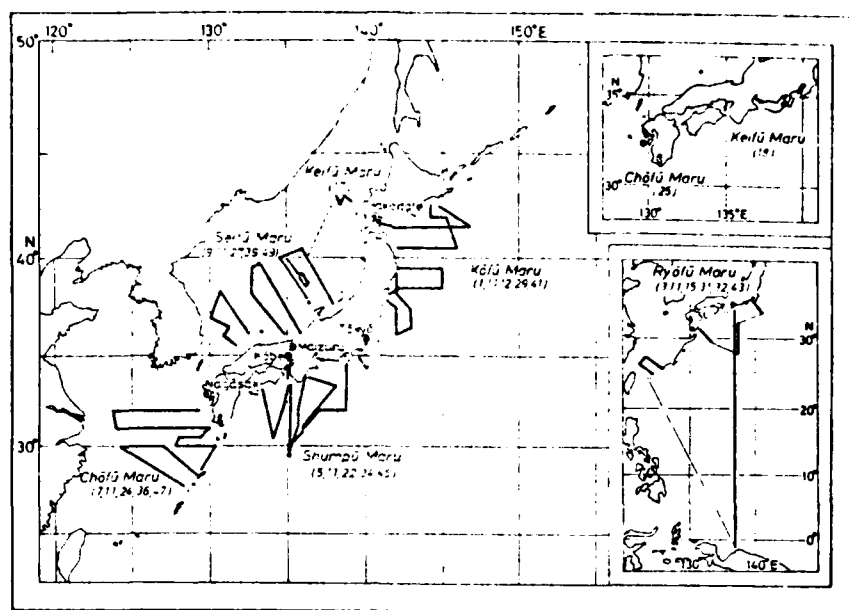


Station location chart, July-Aug., 1977
The numerals in parentheses indicate the table numbers.

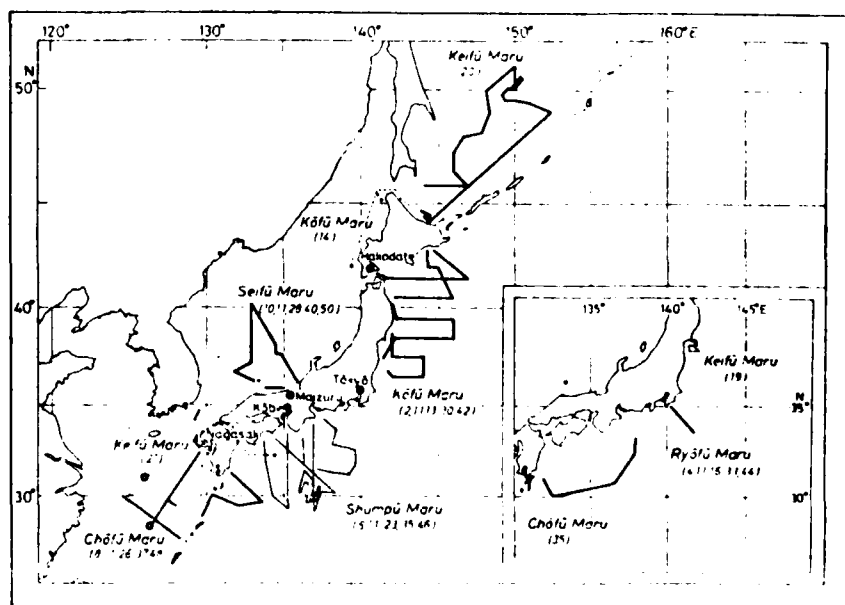


Station location chart, Sept.-Dec., 1977
The numerals in parentheses indicate the table numbers.

CRUISE TRACKS BY JAPAN METEOROLOGICAL AGENCY, YEAR 1977



Station location chart, Jan. - Mar., 1978
The numbers in parentheses indicate the table numbers.



Station location chart, Apr. - June, 1978
The numbers in parentheses indicate the table numbers.

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Dr. James M. Coleman
Coastal Studies Institute
Louisiana State University
Baton Rouge, LA 70803

Dr. Douglas L. Inman
Center for Coastal Studies (A-009)
Scripps Institution of Oceanography
San Diego, CA 92132

Dr. Doron Nof
Oceanography-Statistics Building
Florida State University
Tallahassee, FL 32306

Dr. Friedrich Schott
Division of Meteorology & Physical
Oceanography - RSMAS
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149

Dr. Duncan Agnew
Institute of Geophysics & Planetary
Physics, A-025
Scripps Institution of Oceanography
LaJolla, CA 92093

Dr. Robert L. Bernstein
Mail Code A-030
Scripps Institution of Oceanography
LaJolla, CA 92038

Head, Inshore Projects Division
NAVOCEANO Code 7100
NSTL Station, MS 39522

Director, Oceanographic Department
NAVOCEANO Code 7000
NSTL Station, MS 39522

Dr. Charles B. Officer
Thayer School of Engineering
Dartmouth College
Hanover, NH 03755

Head, Ocean Projects Division
NAVOCEANO Code 7200
NSTL Station, MS 39522

Dr. Choule Sonu
Tekmarine, Inc.
37 Auburn Avenue
Sierra Madre, CA 91024

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