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From: Chief, Naval Technical Mission to Japan.  
To : Chief of Naval Operations.

Subject: Target Report - Oceanography in Japan.

Reference: (a)"Intelligence Targets Japan" (DNI) of 4 Sept. 1945.

1. Subject report, dealing with Target X-40(N) of Fascicle X-1. of reference (a), is submitted herewith.

2. The investigation of the target and the target report were accomplished by Commander Charles J. Fish, USNR, assisted by Lieutenant John Catt, RNVR, as interpreter.



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Captain, USN

**RESTRICTED**

**X-40(N)**

## **OCEANOGRAPHY IN JAPAN**

**"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945**

**FASCICLE X-1, TARGET X-40(N)**

**MARCH 1946**

**U.S. NAVAL TECHNICAL MISSION TO JAPAN**

# SUMMARY

## MISCELLANEOUS TARGETS

## OCEANOGRAPHY IN JAPAN

The present report on oceanography in Japan since 1940 is based on interviews with naval and civilian marine scientists, published documents, unpublished manuscripts and data, and discussions on investigations now underway. In the course of the work conferences were held with 83 scientists representing 41 institutions and departments concerned with various aspects of oceanography.

The report contains a discussion of the importance of oceanography in Japan, its status when the war began, and action taken to meet increased military requirements. War projects, undertaken at the request of the Army and Navy, and non-military research are presented, with the explanations of the Japanese scientists who directed the work.

The status of Japanese marine laboratories in 1946 is described in Enclosure (B). Preparatory work, prior to undertaking the mission, included a review of a report by Dr. T. Weyland Vaughan summarizing Japanese oceanographic and marine biological laboratories in 1937. For convenience in determining wartime changes the form adopted in the present report is the same as that used in Dr. Vaughan's report. Of the 23 principal Japanese marine laboratories established before 1940, all but three remain, and are either operating now or planning to resume work shortly. Operating budgets for future work cannot be estimated at the present time. The Palau Tropical Biological Station was completely destroyed and cannot be restored because the area will no longer remain under Japanese control. The government stations in Korea and Formosa are also no longer Japanese but will be continued under local government auspices. In the home islands three important new marine stations were established during the war. Six laboratories were occupied either by Japanese or American forces, eight were damaged by bombing, and four staff members were killed or severely injured.

The work of Japanese marine investigators since 1940 is recorded in 61 manuscripts (Enclosure E), 2,317 other documents (Enclosure E), and 84 disc recordings on subsurface noises (Enclosure I), which have been sent to the U.S. Hydrographic Office for use by the Oceanographic Division and cooperating marine laboratories. Publications in most cases stopped by 1944, owing to a shortage of materials rather than involvement of any appreciable number of scientific personnel in the military effort.

Relatively little use was made of trained oceanographers by the Navy and even less by the Army. Most scientists continued their prewar studies except when granted funds by the National Research Council for work on special war projects after 1942.

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## A. Location of Targets:

Hydrographic Department, Ministry of Transportation, TOKYO.  
General Central Meteorological Observatory, Ministry of Transportation, TOKYO.  
Imperial Fisheries Experimental Station, Ministry of Agriculture and Forestry, TOKYO.  
Imperial Fisheries Institute, (Kominato Marine Biological Laboratory), Ministry of Agriculture and Forestry, TOKYO.  
Faculty of Science, (Misaki Marine Biological Station), Tokyo Imperial University, TOKYO.  
Faculty of Agriculture, Fisheries Institute, (Shinmaiko Fishery Laboratory), Tokyo Imperial University, TOKYO.  
TOKYO University of Literature and Science, (Shimoda Marine Biological Station), TOKYO.  
National Research Council, Tokyo Imperial University Campus, TOKYO.  
Japan Society for Promotion of Scientific Research (Palau Tropical Biological Station), Tokyo Imperial University Campus, TOKYO.  
East Asia Research Institute, TOKYO.  
Imperial Marine Observatory, KOBE.  
Kyoto Imperial University (Seto Marine Biological Laboratory, Institute of Physical Oceanography), KYOTO.  
Kyushu Imperial University (Amakusa Marine Biological Laboratory), FUKUOKA, Kyushu.  
Faculty of Science, Tohoku Imperial University (Asamushi Marine Biological Station), SENDAI.  
Fisheries Division and Chemical Institute, Tohoku Imperial University (Onagawa Fisheries and Oceano-Chemical Laboratory), SENDAI.  
Faculty of Science, Hokkaido Imperial University (Akkeshi Marine Experimental Station, Institute of Algological Research), SAPPORO, Hokkaido.  
Fisheries Institute and Institute of Low Temperature Science, Hokkaido Imperial University, SAPPORO, Hokkaido.  
Hakodate Marine Observatory, HAKODATE, Hokkaido.  
Fisheries Research Station of the Government-General of Chosen, FUSAN, Korea.

## B. Japanese Personnel Who Assisted in Gathering Documents:

Dr. K. HIDAKA, in charge Dept. of Research, General Central Meteorological Observatory, TOKYO.  
Dr. Y. HIYAMA, Asst. Professor, Fisheries Institute, Imperial University, TOKYO.  
Dr. H. NIINO, Professor, Oceanographical Laboratory, Imperial Fisheries Institute, TOKYO.

## C. Japanese Personnel Interviewed:

As listed in Enclosure (A).

## D. Related Reports:

1. "Report on Scientific Intelligence Survey in Japan, Sept. and Oct. 1945", Vols. I - III, 1 Nov. 1945, Scientific and Technical Advisory Section, GHQ, U.S. AFPAC.
2. Consolidated Accession Lists of G-2, GHQ, SCAP.
3. "Japanese Hydrography, Article 1 - Organization, Operation, and Methods", NavTechJap Report, Index No. X-18-1.
4. "Japanese Hydrography, Article 2 - Wind and Weather Data, Including High Altitude Radar Maps", NavTechJap Report, Index No. X-18-2.

## INTRODUCTION

The lack of adequate information on oceanographic conditions obtaining in waters under Japanese control was keenly felt by U.S. military forces during the recent campaigns in the western Pacific. As extensive surveys were known to have been carried out throughout this region by the Japanese, a program was formulated originally for the acquisition of Japanese oceanographic data of importance in mine warfare and later was expanded at the request of the Hydrographic Office to incorporate material for more general application.

Desired information on Pacific Ocean conditions comprised seasonal, vertical, and geographical distribution of sea temperature, salinity, density, chemical composition of the water, currents, and fouling organisms; transparency, waves, sea ice, composition of the bottom, and physical and biological factors affecting underwater sound.

The program also included a study of the application by the Japanese of oceanography to military use; utilization in the war effort of prewar non-military government and private marine laboratories and the present status of these institutions; number, names, and duties of the scientific personnel; published reports and pertinent unpublished manuscripts.

Prior to leaving the United States, available publications dealing with oceanography in Japan were reviewed and intelligence on all known prewar Japanese marine stations and scientific personnel summarized. For more recent information, and to avoid duplication of effort, records of the following U.S. organizations were reviewed upon arrival in Japan: Far Eastern Air Forces, Aerology Section; SCAP Economics and Scientific Statistics Section; and the Technical Intelligence Center of G-2, WDIT.

Preliminary work for this mission also included compilation of a list of the grants for oceanographic research made by the three national foundations which supported most of the civilian wartime research on military problems. Subjects and recipients were noted for further investigation. With this information and that obtained from personnel of other institutions, interrogations at each laboratory could be based on advance knowledge of the major subjects occupying the staff during the past four years.

The procedure thereafter consisted of a succession of conferences with the scientific personnel of those Japanese institutions engaged in oceanographic work, and acquisition of pertinent data, manuscripts, and documents.

Investigations of Japanese oceanography and hydrography, two closely related subjects, were carefully correlated to avoid duplication. All available charts and published documents on hydrography and oceanography issued by the Japanese Hydrographic Department were collected in connection with Nav-TechJap reports on Japanese Hydrography, Index Nos. X-18-1, X-18-2, and X-18-3. In the program for the investigation covered by this report, Japanese naval publications were omitted, except for certain documents which were acquired on request (22 January 1946) from the Hydrographic Office.

Naval Research Laboratories (the First and Second Naval Technical Institutes and the Tokyo Naval Experimental Research Laboratory) also are omitted in the present report, as they were included previously in the Scientific Intelligence Survey (Reference D-1). The only basic oceanographic work of significance was that on "Underwater Sound" carried on by the Second Naval Technical Institute Station near NUMAZU and described in Reference D-1, Vol. I, pp 40-42. Contributions of civilian personnel of other organizations are discussed in the present report.

*continued*

In addition to the contributions made by Navy Central Meteorological Observatory and certain physical science departments of Imperial Universities, much oceanographic work in Japan has been carried on by marine biological and fisheries laboratories in connection with other studies.

For better coordination with parts of the Army Military Government program involving acquisition of marine biological data, field projects of common interest were carried on jointly. This arrangement proved mutually advantageous, and the excellent cooperation of Col. R. H. FIEDLER and Capt. J. L. KASHK is acknowledged with appreciation.

The work was further facilitated by the employment of Rear Admiral Toshio AKIYOSHI as a NavTechJap technical advisor and translator. Admiral AKIYOSHI served as a member of the Hydrographic Department of the Imperial Japanese Navy for 20 years and during the war was in charge of the Second Division (surveying, oceanography, astronomy). Being an experienced oceanographer (ScD, Tokyo Imperial University), a member of the National Research Council familiar with Japanese ocean work and workers, and a professed advocate of free interchange of oceanographic information, his services proved of considerable value.

It was decided that at least one set and where possible, five sets of all readily accessible oceanographic publications since 1940 should be obtained and forwarded directly by NavTechJap to the Hydrographic Office (Enclosure F). It was made clear to each institution that these publications were requested in addition to those called for in SCAP directive No. 3, and would not obviate complete compliance with the directive. It was further explained that the purpose of the request for additional publications on oceanography was to provide one set for the Hydrographic Office and others for redistribution by that office to marine laboratories, thereby making the Japanese material available to American investigators at several key points within a few months. All cooperated willingly, as the Japanese are anxious to bring to the attention of American scientists the results of their research. They also bemoan the absence of foreign scientific publications since 1941 and plead for an early resumption of international exchanges.



# THE REPORT

## A. IMPORTANCE

Oceanography in the decade prior to the war received more widespread attention and greater financial support in Japan than in any other nation. In fact the number of vessels utilized for whole or part time oceanographic work, some 95, probably exceeded those of all other nations combined. This was in part due to Japan's determination to leave no stone unturned in advancing her naval and mercantile marine power, and in part to the demands of her fishery industry, the world's largest.\*

## B. SOURCES OF FINANCIAL SUPPORT

Virtually all oceanography in Japan has been supported directly or indirectly by the Japanese Government. Oceanographic observations and research were carried on by the Navy, seven central government civilian institutions (including branch marine observatories), over a dozen Prefectural Fisheries Experimental Stations, and at least 17 government financed marine laboratories (Enclosures B, C, D). Of the three national foundations making grants for civilian research (Reference D-1), the National Research Council and the Board of Technology were entirely government supported, and the third, the Japanese Society for the Promotion of Scientific Research, although technically dependent on membership contributions, received frequent government allotments for special projects of interest to military or civilian government agencies. Even the scientific societies of oceanography, when not officially supported by government institutions, were usually housed in them and were composed almost wholly of scientists from staffs of government institutions, the purpose of most societies being to provide additional facilities for publication of scientific papers.

A relatively small amount of support for marine research and publication has been afforded by four private organizations, the Hattori Foundation, the Baron Tokugawa Memorial Society, the Mitsui Laboratory, and the Odawara Laboratory financed by the commercial fisheries. The first two of these organizations grant funds for research on specific projects or to defray the costs of publication; the latter two maintain laboratories for the study of marine biology.

## C. SOURCES OF OCEANOGRAPHIC INFORMATION

Japanese oceanographic surveys have been carried on almost entirely by or under the direction of the Hydrographic Department of the Imperial Navy except for certain local studies in home waters. The program, at first combined with hydrographic surveys, was instituted in 1929 and continued for nine years with six naval survey vessels working independently and ranging over much of the western and northern Pacific. In 1938, however, an entirely new policy was adopted. This called for systematic accumulation of oceanographic data on a large scale, and necessitated an increased number of vessels to make simultaneous observations. Contracts were let for the construction of six special

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\*The presence about the Japanese home islands of water masses having markedly different physical characteristics which, in turn delineate the ranges of certain important commercial species of fish, makes possible immediate practical application of oceanographic data by the fishery industry.

"Naval Observation" (200 ton KAIYO class) ships: Arrangements were also made for the loan of vessels of various government agencies, and the chartering of commercial craft (mostly whale catchers during the slack season), supplemented by small fishing vessels for coastal observations. Government prefectural vessels were later drafted for service in August 1940 and thereafter gradually replaced the commercial vessels, which had not proven very satisfactory. Whale catchers were last used in July 1941 and other commercial ocean vessels in September 1943.

The expansion of open ocean work from 1938 to late 1943, and thereafter the gradual depletion of vessels and consequent restriction of operations to home coastal waters until cessation in September 1944, are indicated in the following vessel-operation records and in the detailed index in Enclosure (B).

VESSELS UTILIZED IN OCEANOGRAPHIC SURVEYS OF THE IMPERIAL JAPANESE NAVY

<u>Number</u>	<u>Class</u>	<u>Periods of Operation</u>
6	Naval Survey vessels	31 July 1929 to 30 Sept. 1942
7	Vessels of other govt. organizations	8 Feb. 1938 to 24 March 1943
24	Commercial ocean vessels	4 Aug. 1938 to 1 Sept. 1943
22	Small coastal fishing craft	22 May 1939 to 4 Sept. 1944
6	Naval observation (KAIYO) vessels	6 Nov. 1939 to 18 Oct. 1943
30	Prefectural station vessels	1 Aug. 1940 to 12 April 1944

The last work carried out for the Hydrographic Department was the periodic reporting of meteorological and oceanographic observations by fishing craft stationed at different points along the coasts of the home islands. This information was then assembled in the Hydrographic and Meteorological Departments and broadcast as a service to naval ships at sea. The two remaining KAIYO class vessels and some small craft were utilized once more, in SURUGA Bay (Apr.-Nov. 1944), in connection with underwater sound investigations of the Navy Experimental Research Station (Enclosure B).

There was little or no coordination between the oceanographic work of the Navy and that of other government scientific institutions even when vessels of the latter participated in naval work. Usually naval personnel were assigned to civilian vessels to carry out the Navy's program and they returned all data to the Hydrographic Department. The information was never made available to civilians.

The original corrected data, representing all oceanographic survey work of the Hydrographic Department from 1929 to 1944 and comprising 31,147 station observations (15,563 ocean stations, 13,075 coastal stations, and 2509 special current observation stations), are bound in 188 record books which were located and have been forwarded to the Hydrographic Office in Washington. The following page from one of the record books shows the type of observations made at a typical ocean station.

When not required by the Navy, vessels of other institutions carried on independent studies, usually in Japanese coastal waters.

The two largest civilian government agencies engaging in oceanographic studies are the General Central Meteorological Observatory with four branch marine observatories, and the Imperial Fisheries Experiment Station. The former has a large and experienced group of investigators who devote themselves largely to research in physical oceanography. The greater part of the more important research in that field since 1940 has been accomplished by members of this group (Enclosure E).

The Imperial Fisheries Experiment Station assembled and published periodically a journal containing complete records of its own observations in coastal wa-

(Sample Page From a Record Book)  
 OCEANOGRAPHICAL OBSERVATION RECORD

STATION NUMBER A 29 DATE 11 FEBRUARY 1938 SURVEYING SHIP KOSHU

POSITION LAT 33°-37.2'N LONG 137°-22.2'E TIME FROM 0808 TO 0940

DEPTH (m)	TEMP. (°C)	SALINITY (°/°o)	SPECIFIC VOLUME	DYNAMIC HEIGHT (m)	pH	O <sub>2</sub> (cc/l)	O <sub>2</sub> (%)	ORGANICS SOLUBLE (O <sub>2</sub> mg/l)	PHOSPHORUS ACID (mg/m <sup>3</sup> )	SILICATE (mg/m <sup>3</sup> )
0	17.63	34.76	0.97542	0.0	8.23	5.23	93.7			275
10	17.63	34.79	0.97534	9.754	8.23	5.23	93.7			275
25	17.65	34.81	0.97528	24.383	8.23	5.19	93.0			255
50	17.66	34.79	0.97519	48.764	8.23	5.20	93.2			285
100	17.33	34.79	0.97491	97.517	8.23	5.22	93.0			350
150	17.68	34.79	0.97478	146.259	8.23	5.15	92.6			230
200	17.49	34.79	0.97453	194.991	8.23	5.15	92.1			270
300	17.47	34.61	0.97358	292.396	8.14	4.47	75.8			560
400	11.89	34.43	0.97278	389.714	8.04	3.84	61.9			1100
500	7.96	34.22	0.97183	486.944	7.84	2.95	43.9			2200
600	6.33	34.25	0.97115	584.093	7.74	2.54	36.5			2640
800	4.39	34.29	0.97002	778.209	7.64	1.69	23.2			4200
1000	3.40	34.38	0.96897	972.107	7.74	1.56	21.0			4920
1200	2.99	34.47	0.96801	1165.805	7.74	1.63	21.7			5360
1500	2.50	34.54	0.96661	1455.998	7.74	1.95	25.7			5440

METEORO- LOGY	TIME	ATM. PRESS.	AIR TEMP.	HUMIDITY	WIND DIR.	WIND FORCE	CLOUD TYPE	CLOUD AMOUNT	WAVE	SWELL
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WATER COLOR & TRANSPAR- ENCY	TIME	SUN'S ACT.	CLOUD TYPE	CLOUD AMOUNT	WATER COLORS	TRANS- PARENCY
	0940	31°	cu	5	4	32m

DEPTH
1605

ters and those made in more than 20 localities distributed around the home islands. A series of similar reports consisting entirely of oceanographic data were published annually by the Korean Governmental Fisheries Experimental Station. The Imperial Fisheries Institute, which was the other large central government marine organization, devoted itself largely to educational work, and limited its vessel activity to student cruises except for surveys ordered by the Navy (Enclosure C, Part II). However, at its Kominato Station daily meteorological and oceanographic observations continued without interruption during and after the war and a complete set of these from 1940 to 1946 have been sent to the Hydrographic Office in Washington together with the above mentioned publications.

Smaller units of marine investigators, attached to the staffs of Imperial Universities and their affiliated laboratories, engaged principally in research, and together comprised a very large group of capable oceanographers.

It was with this considerable reservoir of oceanographic institutional facilities, trained personnel, and accumulated information that Japan entered the war; yet surprisingly little wartime use was made of these resources.

D. SITUATION AT BEGINNING OF WAR

The Hydrographic Department of the Imperial Navy had in the past engaged in little other than surveying and preparation of navigational guides. Security restrictions had also always been so rigid that military laboratories and personnel were isolated and allowed no cooperation with civilian specialists.\* For this reason there was in the Hydrographic Department a dearth of competent personnel experienced in research.

Dr. Koji HIDAKA, in charge of research at the General Central Meteorological Observatory and one of Japan's outstanding oceanographers, described the situation as follows:

"The cooperation of Japanese oceanographers with the Army and Navy was not really active before 1944. This seems to be because both Army and Navy had their own scientific staffs and institutions whose equipment, facilities, and funds far exceeded those of universities and civil institutions. These military institutions exercised almost a monopoly on facilities before and during the war. If scientists other than those belonging to the Army or Navy wished to make researches, they had difficulty in finding apparatus, materials and assistants. The new graduates of universities all went to the Army or Navy in recent years. They were indeed made to work in those institutions where the staffs for the most part were not able and the efficiency of the researches was poor. Most professors in the Universities were thus left without assistants and materials. It became almost impossible for them to continue their researches without some relations with military and naval institutions. The staffs of the latter, however, were not necessarily investigators of the first rank and had a tendency to prevent experienced scientific men from entering their institutions. Most had served in the Army or Navy for ten to twenty years, having entered at a time when few capable university graduates cared to join voluntarily. Some of the young scientific officers (graduated of recent years) were of course able because almost all were properly qualified graduates of universities and colleges, but the scantiness of cap-

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\*Only in the case of certain civilian projects instituted at the request of The Army or Navy after 1942, were scientists from civilian government agencies permitted to participate in joint conferences with Army or Navy Personnel.

able senior staff members prevented them from exercising their abilities freely. In the field of oceanography things were the same. We had no positive cooperation with them before the end of 1943."

#### E. WARTIME ORGANIZATIONAL DEVELOPMENTS

An attempt to establish a basis for cooperation between the three largest government oceanographic organizations, the Hydrographic Department, the General Central Meteorological Observatory, and the Imperial Fisheries Experimental Station, was made in 1941 by Professor H. TOMINAGA of Tokoku Imperial University. As a result of his efforts the Oceanographic Society of Japan was formed and Dr. T. OKADA, the oldest member, became president. It is not possible to evaluate the effect of this society on subsequent developments in Japan because the need to mobilize for joint civilian and military scientific effort was everywhere becoming evident at that time. The gradual response is seen in subsequent action during the period, 1942-1944.

In 1942 a Board of Technology, designed to function as the OSRD in the United States, was established directly under the Prime Minister for the support and coordination of wartime research (Reference D-1). At the same time the Society for the Promotion of Scientific Research created the "Fourteenth Special Committee for the Exploration of the Ocean", consisting of 28 scientists from the Navy and leading civilian institutions concerned with oceanography. Monthly meetings were held under the chairmanship of Dr. T. OKADA. The Hydrographic Department was represented by five committee members, Vice Adm. D. SOEJIMA, Rear Adm. T. AKIYOSHI, Lt. Comdr. S. OTSUKA (substituting for Capt. S. DAITO, S. KAWAHARA, and S. MIYAHARA.\*

In 1943 the National Research Council, which, although of recent origin (1939) had not previously given particular attention to wartime needs, added ¥10,000,000 specifically for projects related to the war (Reference D-1). This provided the necessary impetus and funds to set in motion a number of large-scale projects. Those relating to oceanography will be discussed later in this report. It was eleventh-hour action, however, and few of the studies were completed in time to be of practical value to the armed forces. The cumbersome methods of making assignments contributed to the delay in obtaining results. When oceanographic projects were referred to the National Research Council by the Army or Navy, much time was frequently lost in selecting large committees and often subcommittees, which then designated an individual or individuals to carry out the investigation. So much emphasis was placed on the appointment of committee members with suitable prestige (even though frequently not familiar with the subjects involved) and so little prominence given to the designated investigators, that it was at times difficult to learn who had actually carried out the work. The unavoidable delays inherent in such a system finally caused the Department of Education to provide a special fund and appeal directly to the investigators. They were invited to make personal application for funds for any studies which in their opinion would prove of importance in the war.

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\*Total action by the committee as reported by Rear Adm. T. AKIYOSHI:

- (a) Preparation of a report on past oceanographical expeditions of all nations, by Dr. S. YOSHIMURA.
- (b) Appointment of a committee for the preparation of a seawater standard for chlorine titration. Only a small part of the requested grant was allowed.
- (c) Committee meeting discussions of communication interferences in the sea. The question had been referred to the committee by the Navy.

The only connection between the Navy and civilian institutions continued to be with the common membership of certain senior Hydrographic Department officials and civilian scientists in the Japanese Society for the Promotion of Scientific Research, the National Research Council, and the Oceanographic Society of Japan. However, to organize better for research within the Hydrographic Department, a Bureau for Study and Research was created in 1944. The Bureau consisted of personnel appointed from each section. This group apparently accomplished little if anything and terminated with the war.

#### F. WAR RESEARCH PROJECTS

Of the three principal national foundations supporting wartime marine research, two, the Technical Board and the Japanese Society for the Promotion of Scientific Research, appear to have confined recent grants in oceanography largely to biological subjects dealing with more effective exploitation of marine food resources. Those of the Board of Technology were:

1. Increase in cultivation of aquatic animals.
2. Conversion of rivers and watersheds into pastures.

The Japanese Society for the Promotion of Scientific Research supported the following:

1. Exploitation of the sea (¥30,000).
2. Biological study of animals living at the bottom of the inner bays and their productive power (¥1800).
3. Deep sea animals along the KII coast (¥400).

to which were added three small grants for the study of river flow and sand drift in inland waters (Reference D-1, Volume III).

Grants for research of immediate concern to the military forces were made by the National Research Council. As recorded in Reference D-1, Volume III, the following were on oceanographic subjects:

<u>Subject</u>	<u>Aim</u>	<u>Investigators</u>
1. Waves along the coasts (¥8000).	Forecasting with reference to landing operations.	N. YOSHIMURA and three others.
2. Prevention of damage to ships by boring organisms (¥55,000).	To prevent action of small boring animals on wooden ships.	Chairman: T. KOMAI, Y.K. OKADA, KANAME, and 11 others.
3. Propagation of pressure waves in water (¥16,000).	Relation between sound propagation and temperature and salt content.	K. HIDAKA and four others.
4. Communication interferences in the sea (¥25,000).	Methods of Preventing interferences in the sea caused by aquatic animals, fish, and small sea weeds. (Research in cooperation with the Navy).	Y. HIYAMA, K. ITO, and four others.
5. Transportation by utilization of ocean currents (¥8000).	Transportation of material from the southern area by utilizing the ocean current.	K. HIDAKA.
6. Cultivation of special aquatic products (¥48,000).	Study of luminous creatures for night military use, and as sources of nutritious products for the military. (Research with Army).	I. AMEMIYA and 12 others.

## 1. Waves Along the Coast.

A grant of ¥8000 for studies on wave forecasting with reference to landing operations was originally made with the expectation that the work would be carried out by N. YOSHIMURA of the General Central Meteorological Observatory. The studies, however, were finally made by Dr. K. HIDAKA and assistants of the same institution and are described in the following statement which he prepared:

"In the fall of 1943 I asked for a grant for the study of coastal waves and breakers on the shore, in order to find the direction of depression and storms. I intended to prepare for weather forecasting at the stage of the war when all the important islands fell to the United States forces. But, sorry to say, my application was dismissed by the staff of the National Research Council.

"In 1944 I again emphasized the necessity of observations on coastal waves and this proposal was finally adopted by the General Central Meteorological Observatory. Preliminary observations were carried out on the sandy beach of SHIRAHAMA on the east coast of the IZU Peninsula in August 1944. The chief investigators were K. HIDAKA, Y. TAKENOUCHI, N. WATANABE, and K. HARAGUCHI. At the same time the Meteorological Service of the Army also appointed us to make a wave survey with reference to defense against landing operations by the American Forces. They requested us to measure the heights and periods of the coastal waves and breakers. In reality these two elements determine the nature of the waves since the wave-length and wave-velocity in deep water can be calculated from the period. The observations were carried out by establishing scaled poles in the water and reading water levels with the naked eye or with telescopes.

"Later the Land Defense Headquarters and subordinate commands requested us to make observations on the waves along the coasts of KANTO District. The observations were carried out on the sandy beach of the KASHIMANADA coast, north of the BOSO Peninsula, in February 1945, and on the KUJUKURIHAMA (northeastern coast of the BOSO Peninsula) in March and May 1945. The chief investigators were Y. TAKENOUCHI, N. WATANABE, and K. YOSHIDA. The research on waves on these coasts has continued and is even now being carried on by members of the General Central Meteorological Observatory and the Geophysical Institute of Tokyo Imperial University.

"Simultaneous observations of coastal waves at several places on SAGAMI Bay were carried out in June-July 1945, and in January 1946 by the same staff. From these observations it has been concluded that the effect of the wind on the height of surf near the shore is considerably less than the height expected from the relation between the waves and winds in the open sea."

Reports on studies made in connection with the wave problem were submitted with the manuscripts listed in Enclosure (E), as items No. 32, 39, and 54.

## 2. Prevention of Damage to Ships by Boring Organisms.

This project, for which the National Research Council allotted ¥55,000, illustrates the elaborate manner in which some of the projects were organized. The original committee appointed by the Council consisted of



eight men under the chairmanship of Dr. T. KOMAI. The other members were, Y. OKADA, I. AMEMIYA, T. IMAI, Y.K. OKADA, M. SUGIYAMA, I. TAKI, and T. UCHIDA.

Later it was decided to extend the scope of the work to include fouling of steel vessels by attached organisms. For this a second committee consisting of Y. OKADA, Chairman, and three other members, H. NOMURA, H. OSHIMA, and E. SAWANO, was formed by the Council.

Still later it was decided that the project should also receive the attention of the Japanese Society for the Promotion of Scientific Research, and this Society created the following imposing "Twenty-Second Special Committee for the Study of Wood Boring Animals:"

#### COMMISSIONERS

##### Biological Section

Dr. T. KOMAI, Prof. Kyoto Imperial University (Chief)  
 Dr. T. UCHIDA, Prof. Hokkaido Imperial University  
 Dr. H. OSHIMA, Prof. Kyusyu Imperial University  
 Dr. Y.K. OKADA, Prof. Tokyo Imperial University  
 Dr. Y. OKADA, Member of Research Institute Natural Resources  
 Dr. I. AMEMIYA, Prof. Tokyo Imperial University

##### Physical Section

Dr. S. HORIBA, Prof. Kyoto Imperial University (Chief)  
 Dr. T. IZUBUCHI, Member of Technical Institute of Naval Dept.  
 Dr. S. KUNIZAWA, Member of Technical Institute of Military Dept.  
 Dr. M. ISHIBASHI, Chief Investigator Nihon Oil Company  
 Dr. M. UCHIDA, Prof. Tokyo Technical College  
 Mr. S. HIROSE, Chief Investigator Kansai Paint Company

#### RESEARCH MEMBERS

##### Biological Section

Dr. S. OKUDA, Assist. Prof. Hokkaido Imperial University  
 Dr. T. IMAI, Assist. Prof. Tohoku Imperial University  
 Mr. T. INO, Assist. Prof. Fisheries College  
 Mr. M. IWASA, Research Member, Science Museum, Tokyo  
 Dr. S. SHIINO, Member, Research Institute Natural Resources  
 Mr. S. MAWATARI, Assistant, Research Institute Natural Resources  
 Mr. Y. OSHIMA, Assist. Prof. Tokyo Imperial University  
 Dr. M. SUGIYAMA, Assist. Prof. Nagoya Imperial University  
 Mr. S. MORI, Special Student, Kyoto Imperial University  
 Mr. T. HABE, Assistant, Kyoto Imperial University  
 Dr. I. TAKI, Assist. Prof. Hiroshima University of Science and

##### Literature

Mr. S. MURAKAMI, Assistant, Kyushu Imperial University  
 Dr. I. HARADA, Assistant Prof. Taijoku Imperial University  
 Dr. N. SASAKI, Assist. Prof. Tokyo Imperial University

##### Physical Section

Mr. M. AI, Assist. Prof. Tokyo Technical University  
 Mr. S. SHIMOMOTO, Assistant Chemical Institute, Kyoto Imperial University  
 Mr. T. KNOSHITA, Researcher Kansai Paint Company



Work was started at most of the marine laboratories by junior investigators under the general supervision of a committee member. The work had just gotten under way when the war ended, and it was discontinued as a group project at the end of the fiscal year (March 1946). Manuscript reports on "Fouling Organisms and Methods of Prevention", by Y. MATSUDAIRA, I. NAKAYAMA and H. YASUDA; "Biological and Chemical Studies on Fouling of Ship Bottoms and Anti-Fouling Paints," by K. FUKAGAWA, E. OYAMA and S. ISHIDA; and an English summary of a paper in Japanese on "Boring Animals Detrimental to Wooden Vessels," by S. MURAKAMI, were obtained for transmittal to the Hydrographic Office. Others will be completed by individual investigators and may be expected when publication of scientific journals is resumed.

### 3. Propagation of Pressure Waves in Water.

A grant of ¥16,000 was made by the National Research Council for a study of the "relation between propagation of sound waves in water and the temperature and salt content of the water". The original work was under the direction of Dr. K. KIDAKA, and formed a part of the general problem of communication interferences for which a second grant was later made. This problem is described in Enclosure (H). Later K. ITO of the Oceanographic Institute of Tokyo Imperial University was assigned the problem of "Sound waves in sea water", but no results have yet been produced.

Further work on the propagation of sound waves underwater was carried on by members of the Second Naval Institute at TOKYO. This work has already been described in ESS-S&R scientific Report No. 27 of the Scientific Intelligence Survey of September 1945.

### 4. Communication Interferences in the Sea.

Spurious subsurface noises formed a major problem to the Japanese Navy and, in addition to the trouble caused to submarines, threatened to render coastal controlled defensive minefields ineffective. As operation of these fields was dependent on acoustic detection of enemy vessels, the disturbance caused by untraceable sounds was critical. This was one occasion when the Navy disregarded its usual security restrictions and attempted to enlist all possible assistance. The story from the Navy's standpoint is given in the following statement by Rear Admiral AKIYOSHI:

"In the summer of 1942, the Hydrographic Department was asked by the Naval Experimental Laboratory to help in an experiment on a sonic problem, at BUNGO SUIDO, where, for the purpose of coast defence, some submarine signal receiving stations were planned. N.E.L. (Naval Experimental Laboratory) had met extraordinary phenomena of noisy sound which were said then to be observed almost periodically-once in the evening daily. The H.D. undertook the oceanographical observations at the place for about a week, Lt. Comdr. DAITO and Dr. UDA and others taking responsibility. The results obtained were: (a) Causes still unknown. (b) Owing to irregular distribution of water density, sound waves should undergo considerable deflections. Records are kept in H.D. Reports were sent to N.E.L.

"The problem has been treated continuously by N.E.L. Naval Mine (Anti-Submarine) College also has investigated the same.

"In 1943-44, N.E.L.'s Submarine Sonic Laboratory at NUMAZU in SURUGA Bay as the organization responsible, entrusted the solution of the problem to several scholars outside the Navy. Drs. FUJIWARA, HIDAKA, TAKENOCHI, and MIYAKE of Central

Meteorological Station took the oceanographic aspects and some biologists and chemists took other aspects. Besides these, H.D. was asked to take a part in oceanographic observations in the same bay, which continued from March-June (1944). The head of observers was Hydro. Engineer ISHII. These records were sent to the H.D. The results were: (a) Observations in such a confined sea of irregular depth with so complicated horizontal and vertical currents, have almost no meaning. (b) Dr. HIYAMA by the end of 1944 (?) ascertained the cause of the noise to be vocal sounds, and frictional sounds in some cases, of groups of some kind of fish. The experiments were made at MISAKI.

"As to what actions have been taken to overcome the fish obstacles, we in the Hydrographic Department were not informed.

"For anti-submarine and sonic ranging purposes it was decided to prepare synthetical charts based on the past oceanographical observations of the broad sea. S. KUWAHARA, Hydro. Engineer, and TAKENOUCHI, Central Meteorological Observatory, did the above work independently, each on his own theory."

The investigations were carried out as two separate projects, owing to differences of opinion on the cause or causes of the sonic disturbances. When no general agreement could be reached in a series of conferences, Naval Officials directed that each group pursue investigations in accordance with its own theory.

The work of the group considering the physical aspects of the problem is described in Enclosure (H). A manuscript chart prepared by Dr. TAKENOUCHI (NavTechJap Equipment No. JE50-5069) has been obtained and submitted. Charts prepared by Hydrographic Engineer KUWAHARA and issued by the Navy are among the published Navy documents previously obtained as part of the hydrographic project.

An outline of the work of the group investigating the biological aspects of the problem, under the direction of Dr. Y. HIYAMA, is given in Enclosure (I), together with a list of 84 recordings of aquatic animal noises which were obtained for the U.S. Navy (NavTechJap Equipment No. JE50-5051).

##### 5. Transportation by Utilization of Ocean Currents.

This problem received considerable attention from Japanese oceanographers who had had long experience in studying bottle drifts in the western Pacific. As explained by Dr. HIDAKA, a Dr. M. UDA, while serving in the Army Transportation Service at HIROSHIMA, made the following recommendation:

"... the utilizing of the KUROSHIO (Japan Current) for the transportation of goods from Formosa, NANSEI SHOTO, etc., to Japan proper. Later the problem was also seriously discussed by other oceanographers but nothing materialized ... this idea arose from results of drift bottle experiments. In the winter of 1943-44, Dr. R. SEKGUCHI, Director of the Tokyo Astronomical Observatory, laughingly remarked that if we lost Formosa, Japan would have no sugar at all. This conversation was continued more seriously and I made a statistical analysis of available data on bottle drifts, concluding that at the period of the SE monsoon, that is, from April to September, about 30 to 50% of those goods set adrift near the northern end of Formosa would reach the coasts of Japan proper. I presented

these results in October 1944 before a meeting of the committee of Geology and Geophysics, National Research Council. This conclusion was supported by Dr. K. KIMURA of the Imperial Fisheries Experimental Station, and I am told that Dr. UDA was also urging the same. This information was then reported, by an Army scientist present at the meeting, to the staff of the Fuel Headquarters of the Army. It appeared to me that he was trying to materialize this plan. He said that the military authorities were hoping to bring gasoline from Formosa in this way. Meanwhile, air raids on Japan began on November 24 and soon the Philippines were lost. The transportation from Formosa was hopeless now. And as far as I know this plan had not an opportunity of being carried into execution.

"On January 11, 1945, a meeting on this subject was held in the General Central Meteorological Observatory and the members were the three personnel of the Army Fuel Headquarters and Drs. M. UDA (He was now a lieutenant), K. KIMURA, S. YOSHIMURA, Y. TAKENOUCHI, and I. Before this meeting the military officers said they were flying to Formosa to execute this plan. (But it appears to me that they never carried it out). They also asked us if it would not be possible to bring the goods in from Manchuria by this method. We replied that this is by far a safer plan, since it is known that almost 90% of the drift bottles set adrift in the Japanese Sea off the east coast of Korea reach the north coasts of HONSHU. KIMURA prepared compact statistics for executing this plan.

"On a snowy day of February 1945, I, accompanying Drs. FUJIWARA and SEKIGUCHI, recommended this plan to the Naval and Military Technical Staffs.

"The reason why we recommended this plan again and again and to different personnel was that they were so inactive in adopting plans recommended by scientists. This, I suppose, was partly because the military men did not trust the scientists and because the Japanese people in general were placed in a low scientific level. But the chief reason was that there were very few patriots among professional military men who dared to risk their professions in executing this plan. They loved their lives and money and not their country and nation. They were always afraid of being dismissed if the execution of a plan was not successful.

"Meanwhile, Dr. R. KINOSHITA, Professor in Pathology, Osaka Imperial University, told me that most Japanese people were now losing their efficiency as the effect of hunger edema which resulted from the lack of amino acids. He said if the present condition of public nourishment persisted until the end of the year, the health of the Japanese people would become fatal, and Japan would lose its working power. It was a serious question how to prevent the state from becoming so dangerous. KINOSHITA insisted that only remedy for this was to import the soybeans from Manchuria utilizing the currents in the Japan Sea. Based on these circumstances KINOSHITA and I explained during March the importance of the transport of soybeans of Manchuria to various personnel in Government, Army and Navy. But there was no reaction. Dr. K. HAYASHI, professor of Osaka Imperial University, sailed himself to Korea in order to encourage the Army to execute this plan. But the result was negative.

"At the end of February, the intensity of American air raids was suddenly enhanced and I moved to NAGANO Prefecture on

March 30, 1945, in order to escape the bombing. I taught oceanography to the university students who accompanied me in a rural, tranquil place, and my activity in this direction naturally died out. It appeared to me that several scientists managed to materialize this plan, but I gave it up after I moved to NAGANO Prefecture. I did my best as a scientist. Further effort was left to the leaders in the government."

Although apparently unknown to Dr. HIDAKA, the Military Transportation Department of the Army, located at HIROSHIMA, called a meeting in early March 1945 on direct orders from Headquarters, TOKYO. The department was ordered to put into effect a proposal to drift materials from FUSAN, Korea, to HONSHU. A preliminary test was first made by towing a small wooden 200 ton ship a short distance from FUSAN and then releasing it. The vessel successfully drifted to HONSHU, but the tests took place too late in the war to be of value.

At the meeting at HIROSHIMA, which was called by the Military Central, the Navy was represented only by an observer, Comdr. OTSUKA. The project was purely an Army affair, the Navy attitude being that the outcome was very uncertain and that a neutral attitude (no advice) should be taken. Civilian scientists, according to Admiral AKIYOSHI, also hesitated to accept responsibility where there appeared a possibility of failure, and all were conspicuous by their absence from the meeting, although they had been invited to attend. It remained for the Army to proceed alone with the tests.

Another plan for using currents to transport produce was proposed by Dr. K. SEKIGUCHI, Director of the Astronomical Observatory of Tokyo Imperial University, in the autumn of 1943. A second grant was then made for current studies by the National Research Council (not recorded in Reference D-1 or D-2). It amounted to ¥20,000 and was for the express purpose of surveying currents in the southern seas (Formosa, etc.,) with reference to the possibility of floating metal drums to Japan. This project was under the direction of Dr. SEKIGUCHI, who appointed a committee consisting of Admiral AKIYOSHI, Dr. HIDAKA, Dr. KIMURA, and Dr. TAKENOUCHI. The plan, which never materialized, involved the drifting of thousands of metal drums or produce containers from Formosa to Japan. The drums would drift below the surface but some in every lot would be equipped with radios, and at intervals would rise and be contacted by land stations in order that their movements could be traced. The recommendation was finally vetoed on the grounds that, (a) submarines and other vessels would be alarmed by so many large floating objects, (b) there would be danger of damage in case of collision, (c) it would be difficult to produce satisfactory containers in the necessary numbers, and (d) the retrieving of the large drums and returning them to suitable places posed too great a task on the available coastal forces.

#### 6. Cultivation of Special Aquatic Products.

This project, for which ¥48,000 was allotted, was entirely an Army affair and was carried on with the greatest secrecy. Dr. I. AMAMIYA, who with twelve others received the assignment through the National Research Council, explained the work of his committee and the results obtained, but claimed to know nothing about the purpose of the investigation. That information had been withheld from him by the Army. Later the answer was supplied by Dr. T. KOMAI of Kyoto Imperial University, who was familiar with previous research on the same material by Professor Newton Harvey of Princeton University, and who may have originally suggested its use to the Army.

The program as first formulated consisted of cultivating, in large quantities, a small luminous crustacean (Cypridina hilgendorffii) and, after drying the bodies, grinding them into a powder. It was soon found that cultivation of the animals was impractical, and the work thereafter consisted of constructing a workable trap, capturing large numbers of specimens and processing them. The trap as finally perfected was about two feet in height, haystack-shaped, and had an opening at the top. It was baited with decomposing fish and placed on the sea bottom in shallow water. The animals, which are feeble swimmers and active only at night, were trapped during the hours of darkness and collected in large quantities each morning. The groundup bodies of dried specimens were then shipped to the army in the form of a brown powder. According to Dr. KOMAI the powder was supplied to army officers on the different fronts. When in close contact with the enemy, and when the use of a flashlight for night reading of messages would be prohibitive, the officer could rub a small quantity of the powder in the palm of his hand, cup it over the paper and read the message by the faint 'cold light' produced when the powder was moistened. Why the Japanese went to such great trouble and expense to produce a marine product for which inexpensive and more easily obtainable substitutes were available is hard to explain.

#### G. NON-MILITARY OCEANOGRAPHY

As the Japanese Army and Navy made no use of civilian marine laboratories except for housing of forces in a few instances, and installation of the Naval Meteorological Department in the General Central Meteorological Observatory late in the war, most of the marine scientists were able to continue their prewar studies unimpeded. The Army and Navy made almost no requests for their services and few appear to have concerned themselves with possible military use of their particular qualifications. Most of the grants of such organizations as the Japanese Society for the Promotion of Scientific Research and the Research Institute for Natural Resources continued to be allotted for non-military studies. The published results of these studies continued to appear in journals of the universities and scientific societies until a shortage of paper and essential materials for some forms of research became acute in 1943 and 1944.

Only one instance was found of group effort in a non-military oceanographic project. This had been necessitated by depletion of the nation's supply of 'Standard Sea Water', obtainable only in Copenhagen, Denmark, and essential for maintenance of international standards in salinity determination by the chlorine titration method. The Navy and the government laboratory at FUSAN, Korea, had adequate quantities and used it in all of their salinity analyses, but after the source of supply in Copenhagen was cut off, most marine stations were forced to seek a substitute.

Action was first taken shortly after the outbreak of the war in Europe. A subcommittee was appointed by the National Research Council, composed of the following members:

- T. NOMITSU, Kyoto Imperial University, Chairman.
- M. UDA, Kobe Marine Observatory.
- K. HIDAKA, General Central Meteorological Observatory.
- M. ISHIBASHI, Kyoto Imperial University.
- K. KIMURA, Imperial Fisheries Experimental Station.
- S. KOKUBO, Tohoku Imperial University.
- H. TOMINAGA, Tohoku Imperial University.
- Y. MATSUDAIRA, Kobe Marine Observatory.
- R. MARUTA, Hydrographic Department, Imperial Navy.
- M. DAITO, Hydrographic Department, Imperial Navy.

The problem was considered of such importance that all members of the Geophysics Section of the National Research Council joined in the general discussions and acted on the recommendations of the subcommittee.

It is not possible to recount here the many proposals made, experiments tried, and failures experienced. The main problem was to select a suitable source of water as nearly identical as possible to the 'Standard Sea Water' previously used. The first supply of the substitute, designated as 'Normal Sea Water', was obtained by the RYOFU MARU which had been sent by the subcommittee to a location west of HACHIJU Island. It was taken just below the surface and returned for analysis in the General Central Meteorological Observatory. Dr. Y. MIYAKE, the Chief Chemist, took the leading part in subsequent work, and three papers on the subject were later published in the Journal of the Oceanographic Society of Japan.

Part I. Vol. I, Nos. 1 and 2, May 1942. H. TOMINAGA and five others.  
Part II. Vol. II, No. 1, November 1942. Y. MIYAKE and Y. YUMURA.  
Part III. Vol. II, No. 2, November (?) 1942. Y. MATSUDAIRA.

Supplementary work included extensive experiments by Dr. TOMINAGA to obtain suitable glass for chemical sample containers. He also made analyses of the 'Normal Sea Water'. This was then issued in the same form of container and labeled in the same way as the imported 'Standard Sea Water'. Dr. ISHIBASHI obtained an allotment of pure silver from the Hydrographic Department for use in attempts to improve the accuracy obtainable in titrating. War developments prevented completion of the work of the supervisory committee but not before a supply of 'Normal Sea Water' had been distributed to the various laboratories where it is still used. A sample has been sent to the Hydrographic office in Washington for analysis.

The war has had surprisingly little effect on the morale of the oceanographers and marine biologists in Japan. Those not called into general military service remained in their laboratories or, in the case of field stations which closed, withdrew to the parent universities and are continuing such of their studies as available facilities will permit at this time.

## ENCLOSURE (A)

## JAPANESE PERSONNEL INTERVIEWED

- S. KIMURA, Director, Hydrographic Department.
- S. SASAKI, Chief of Secretariat Division, Hydrographic Department.
- S. DAITO, Chief of Executive Section, Hydrographic Department.
- Y. UWOZUMI, Chief of Oceanography Section, Hydrographic Department.
- S. OTSUKA, Member of Oceanographic Section, Hydrographic Department.
- Y. CHINO, Member of Surveying Section, Hydrographic Department.
- T. AKIYOSHI, formerly in charge Second Division (Oceanography, Astronomy, Surveying), Hydrographic Department.
- N. KASUGA, Director, Imperial Fisheries Experiment Station.
- I. GENSHO, Physics, Imperial Fisheries Experiment Station.
- M. MIGITA, Chemistry, Imperial Fisheries Experiment Station.
- M. SAKAI, Fishing, Imperial Fisheries Experiment Station.
- K. KIMURA, Fish Technology, Imperial Fisheries Experiment Station.
- H. HIGASHI, Fish Technology, Imperial Fisheries Experiment Station.
- S. NAKANO, Fish Culture, Imperial Fisheries Experiment Station.
- S. FUJIMORI, Fish Culture, Imperial Fisheries Experiment Station.
- T. HANAOKA, Biological Oceanography, Imperial Fisheries Experiment Station.
- K. KIMURA, Physical Oceanography, Imperial Fisheries Experiment Station.
- Y. SUGIURA, Director, Imperial Fisheries Institute.
- H. NIINO, Oceanographic Laboratory, Imperial Fisheries Institute.
- I. KUBO, Plankton, Zoological Laboratory, Imperial Fisheries Institute.
- I. MATSUI, Zoological Laboratory, Imperial Fisheries Institute.
- K. MATSUBARA, Zoological Laboratory, Imperial Fisheries Institute.
- Y. MATSUIKE, Chemical Laboratory, Imperial Fisheries Institute.
- S. KAMIYA, Physical Laboratory, Imperial Fisheries Institute.
- Y. TAKIGUCHI, Fishing Laboratory, Imperial Fisheries Institute.
- Y. MIYAMA, Technological Laboratory, Imperial Fisheries Institute.
- S. FUJIWARA, Director, General Central Meteorological Observatory.
- K. HIDAKA, in charge, Dept. of Research, Central Meteorological Observatory and in charge, Geophysical Research, TOKYO Imperial University.



## ENCLOSURE (A), continued

- H. ARAKAWA, in charge, Dept. of Investigation, Central Meteorological Observatory.
- T. MIYAKE, Chief Chemist, Central Meteorological Observatory.
- S. YOSHIMURA, Oceanographer, Central Meteorological Observatory.
- T. TAKENOUCHI, Oceanographer, Central Meteorological Observatory.
- T. K. OKADA, Director, Misaki Marine Biological Station; in charge Zoology, Tokyo Imperial University.
- I. ANEMIYA, Director, Mitsui Institute of Marine Biology and in charge, Fisheries Institutes of Tokyo and Tohoku Imperial Universities.
- K. ITO, Oceanographic Section, Fisheries Institute, Tokyo Imperial University.
- T. HIYAMA, Fishery Section, Fisheries Institute, Tokyo Imperial University.
- Yaichiro OKADA, Head, Zoology Dept., Research Institute for Natural Resources.
- K. KOENUMA, Director, Imperial Marine Observatory, KOBE.
- T. MATSUDAIRA, Oceanographer and Planktonologist, Imperial Marine Observatory, KOBE.
- T. SAITO, Physical Oceanographer, Imperial Marine Observatory, KOBE.
- Z. YASUI, Physical Oceanographer, Imperial Marine Observatory, KOBE.
- R. TORIGAI, President, Kyoto Imperial University.
- T. KOMAI, Director, Seto Marine Biological Laboratory; Dean, School of Science, Kyoto Imperial University.
- M. ISHIBASHI, Professor, Analytical Chemistry, Kyoto Imperial University.
- S. HORIBA, Professor, Physical Chemistry, Kyoto Imperial University.
- M. HASEGAWA, Professor, Geophysics, Kyoto Imperial University.
- T. KAWAMURA, Otsu Limnological Laboratory, Kyoto Imperial University.
- S. MORI, Special Research, Boring and Fouling Organisms, Kyoto Imperial University.
- T. TOYOHARA, Acting Director, Institute of Physical Oceanography, Kyoto Imperial University.
- K. SENO, Institute of Physical Oceanography, Kyoto Imperial University.
- T. ITO, Professor, Geophysics, Faculty of Science, Kyushu Imperial University.
- H. AIKAWA, Planktonologist, Fisheries Dept., Kyushu Imperial University.
- K. UCHIDA, in charge, Fisheries Dept., Kyushu Imperial University; formerly member of the Fisheries Research Station of Chosen, FUSAN.
- M. KUNIHARA, Marine Biologist, Faculty of Science, Kyushu Imperial University.
- T. MATSUDAIRA, Marine Biologist, Faculty of Science, Kyushu Imperial University.



## ENCLOSURE (A), continued

- S. MURAKAMI, Marine Biologist, Faculty of Science, Kyushu Imperial University.
- K. SUDA, Director (Oceanographer) Fukuoka District Meteorological Observatory.
- S. HOZAWA, Director, Asamushi Marine Laboratory; Professor of Zoology, Tohoku Imperial University.
- T. IMAI, Director, Onagawa Fisheries and Oceano-chemical Laboratory.
- H. YABE, Emeritus Professor Geology, Tohoku Imperial University.
- K. HATAI, Professor of Paleontology, Faculty of Science, Tohoku Imperial University.
- H. TOMINAGA, Professor of Physical Chemistry, Faculty of Science, Tohoku Imperial University.
- K. HONDA, Director, Research Institute of Physical Metallurgy, Tohoku Imperial University.
- S. NOMURA, Institute of Biology, Tohoku Imperial University.
- K. HISHIDA, Physical Oceanographer, Onagawa Fisheries and Oceano-chemical Laboratory; formerly Oceanographer, Imperial Navy Hydrographic Department.
- I. MOTOMURA, Professor, Institute of Biology, Tohoku Imperial University.
- F. NUMACHI, Director, Institute of High Speed Mechanics, Tohoku Imperial University.
- T. UCHIDA, Director, Akkeshi Marine Experimental Station; Professor, College of Science, Hokkaido Imperial University.
- S. YAMADA, Director, Institute of Algological Research; Professor, College of Science, Hokkaido Imperial University.
- T. HAYASHI, Oceanographer, Experimental Research Institute, Hokkaido Imperial University.
- K. AKUTSU, Physicist, Experimental Research Institute, Hokkaido Imperial University.
- T. FUKUTOMI, Oceanographer, Institute of Low Temperature Science, Hokkaido Imperial University.
- N. INOUE, Physicist and Oceanographer, Institute of Low Temperature Science, Hokkaido Imperial University.
- T. INUKAI, Professor, Zoology, Faculty of Agriculture and Science, Hokkaido Imperial University.
- S. MATODA, Asst. Professor Planktonology and Fisheries Oceanography, Institute of Fisheries, Hokkaido Imperial University.
- J. TOKIDA, Professor Aquatic Botany, Institute of Fisheries, Hokkaido Imperial University.
- M. NAKANO, Director, Hakodate Marine Observatory.
- M. CHO, Acting Director, Government Fisheries Experimental Station, KOREA.

*ENCLOSURE (A), continued*

L. SAITO, Division of Fishery, Government Fisheries Experimental Station, KOREA.

K. FUJIKAWA, Division of Fishery Industry, Government Fisheries Experimental Station, KOREA.

T. KO, Zooplanktonologist, Government Fisheries Experimental Station, KOREA.

S. KUY, Chemical Oceanographer, Government Fisheries Experimental Station, KOREA.

M. OSHIMA, former Chief Zoological Section, Government Institute of Science, FORMOSA.

## ENCLOSURE (B)

THE PRESENT STATUS OF JAPANESE OCEANOGRAPHIC  
AND MARINE BIOLOGICAL STATIONS

## TOKYO Area:

Hydrographic Department of the Ministry of Transportation.  
General Central Meteorological Observatory of Japan.  
Imperial Fisheries Experimental Station.  
Imperial Fisheries Institute.  
Misaki Marine Biological Station.  
Kominato Marine Biological Laboratory.

## North of TOKYO:

Onagawa Fisheries and Oceano-chemical Laboratory.  
Miyako Meteorological Observatory.  
Hachinohe Meteorological Observatory.  
Asamushi Marine Biological Station.  
Hakodate Marine Observatory.  
Oceanographic Division, Institute of Low Temperature Science.  
Akkeshi Marine Biological Station.  
Oshoro Marine Biological Station.  
Institute of Algological Research.

## West of TOKYO:

Shimoda Marine Biological Station.  
Mitsui Institute of Marine Biology.  
Sugashima Marine Biological Station.  
Imperial Marine Observatory, Kobe.  
Institute of Physical Oceanography.  
Seto Marine Biological Laboratory.  
Onomichi Marine Biological Laboratory.  
Amakusa Marine Biological Laboratory.

## KOREA:

Fisheries Research Station, CHOSEN.

## FORMOSA:

Formosan Government Marine Fisheries Experiment Station.

## PALAU Islands:

PALAU Tropical Biological Station.

\* \* \* \* \*

HYDROGRAPHIC DEPARTMENT

History or Origin: Established 28 July 1871, first under the War Department as the Naval Hydrographic Bureau, later transferred in 1872 to the Navy Department, which was established during that year. The Naval Meteorological (Third) Division became an independent department in 1944.

Location: 5 Chome, Tsukiji, Kyobashi Ward, TOKYO.

*ENCLOSURE (B), continued*

Organization to Which Attached: Ministry of Transportation since 28 Nov. 1945.

Purposes: Under the Imperial Japanese Navy the Hydrographic Department conducted the preparation and issue of hydrographic and aeronautical publications, undertook the survey of coasts and seas, made recommendations and issued notices regarding safety of navigation, and trained hydrographic engineers. It also conducted surveys, observations, and research on meteorology and oceanography for the Navy.

Organization: The organization of the Hydrographic Department was revised in May 1941 and again in November 1945 when the department was transferred from the Ministry of the Navy to the Ministry of Transportation. The present organization is as follows:

Secretariat  
     Executive and Accounts Sections.  
 First Division  
     Surveying, Oceanography and Astronomy Sections.  
 Second Division  
     Compilation and Printing Sections Hydrographers Training School.

Branches: There are no branch offices, but during the war the Hydrographic Department supplied technical material, personnel and apparatus to equip two Hydrographic Field Stations established to serve under the Fleet Command and be responsible only to the Command.

1. The SHANGHAI Hydrographic Office was established to serve the China District Fleet. Its activities were confined to the YANGTZE River and its approaches. Y. HOURI was the first Director, and Capt. Y. IMAMURA the last. Work terminated when the war ended.

2. The Southern Hydrographic Office was established in June 1943 to serve the S.W. District Fleet, and was located at SURABAYA. T. ARUGA was the first Director, and Y. HOURI the second and last. The office closed in February 1945. Extensive oceanographic survey work was carried out in the region under Capt. N. DAITO and the results were published as confidential serials of the Southern Area Navy Route Department. (Officials reported that all documents received in TOKYO from the Southern Hydrographic Office had been destroyed.

3. A third field station, the Makassar Research Station, was established under Japanese Navy Administration in MAKASSAR in 1943 (?). This was not a marine station. It was developed for comprehensive terrestrial investigations. Seven sections were planned: administration, medicine, hygiene, geology, forestry, agriculture, and habits and manners of natives. Little word was received in TOKYO from this station. According to Rear Admiral AKIYOSHI, Dr. S. HATAI joined the staff after leaving PALAU and was probably the Director. Only the Department of Political Affairs for the Southern District (NANPOSEIMUBU) of the Ministry of the Navy maintained contact with the station. The Hydrographic Department could obtain no information; Admiral AKIYOSHI was later informed that little if any research had been carried out.

Equipment: Prior to the war the Hydrographic Office had acquired six surveying vessels (1400-4000 tons) and six oceanographic observation vessels (200 tons). Most of these were either sunk during the war or otherwise disposed of. At the present time three remain available for service:

KAIYOMARU No. 3 (200 tons)  
 KAIYOMARU No. 4 (200 tons)  
 TENKAIMARU (120 tons)

## ENCLOSURE (B), continued

Following an earthquake in 1923, which destroyed most of the buildings, the institution was rebuilt by 1933 and thereafter expanded by the addition of a storehouse in 1938, operating rooms for oceanographic and meteorological work in 1940, and for aerial-photo surveying in 1942. In an air raid on 10 March 1945 the greater part of the institution was burned, leaving intact only the main building, a foundry, and three storehouses.

Provision for Publication of Results: Notices to Mariners, Translation of Foreign Sailing Directions, Sailing Directions for Japan, The Russian Maritime Provinces, and the China Pilot. These, together with those for Bengal, Philippine ISLANDS, Borneo, the western and eastern side of the China Sea, and most parts of Eastern Archipelago and Hawaii, 55 volumes; Ocean Passages, 1 vol.; Coastal Passages, 1 vol.; the Light Lists for Japan and other parts of the Orient, 2 vols.; separate volumes of sailing directions for various maritime regulations, Tide-tables, Nautical Almanac, Astronomical Navigation Tables, Distance Tables, List of Japanese Place Names, Hydrographic Bulletin (SUIROYOHO), Bulletin of the Hydrographic Department of which eight volumes have been issued (being irregular reports of studies and investigations).

Postwar Status: When the war ended, certain permanent staff members occupying key positions in the Hydrographic Department were replaced by high-ranking Naval Officers of the Line seeking secure jobs. Rear Admiral T. AKIYOSHI, who had served in the Department and throughout the war had been in charge of the former Second Division (surveying, oceanography, astronomy), was one of the permanent staff members displaced in September 1945. In accordance with a directive by SCAP, these new officers were later forced to resign, leaving the Department now badly disorganized.

Another directive by SCAP (SCAPIN-794), dated 5 March 1946 (CE), orders, "immediate resumption of normal peacetime functions of Japanese Hydrographic Department". The directive in effect authorizes the resumption of hydrographic and oceanographic work essential to shipping and the fishery industry in Japanese home waters. The Director of the Ministry of Transportation is Acting Director of the Hydrographic Department (9 March 1946), pending selection of a Director.

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GENERAL CENTRAL METEOROLOGICAL OBSERVATORY OF JAPAN

History or Origin: Established in 1876.

Location: Takehira-cho 2 and Otemachi-1, Kojimachiku, TOKYO.

Organization to which attached: Ministry of Transportation. (Transferred from Ministry of Education in 1943.)

Purposes: General Meteorological investigations including allied researches in oceanography, seismology, weather forecasting and warning, and terrestrial magnetism.

Scope of Activities:

1. Weather forecasting and warning and printing weather charts.
2. Radio reception and sending of weather reports.
3. Work shops for construction of instruments.
4. Chronometer repairing.
5. Solar radiation and its influence on living organisms.
6. Oceanographical investigations.
7. Seismology
8. Terrestrial magnetic observations.

## ENCLOSURE (B), continued

9. Chemical meteorology.
10. Agricultural meteorology.
11. Sanitary meteorology.
12. Aerology.

Equipment:

1. General business offices.
2. Meteorological laboratories.
3. Weather service equipment.
4. Work shops for repair and manufacture of instruments.

Branch Observatories:

1. Imperial Marine Observatory, KOBE.
2. Miyako Meteorological Observatory.
3. Hakodate Marine Observatory.
4. Hachinohe Meteorological Observatory.

Vessels (TOKYO):

1. M.S. RYOFUMARU, steel vessel of 1200 tons, special construction for meteorological and oceanographical observations. Length 225 ft., beam 35 ft., twin screws, speed 15 knots.
2. M.S. ASASHIOMARU, 58 tons, length 21.9 meters, breadth 4.9 meters, speed 8.5 knots.
3. M.S. YUSHIOMARU, 140 tons, length 29.6 meters.

Staff: 1813 total. 70 engaged in special investigations. Director: Dr. S. FUJIWARA.

1. Chief of the Forecast Division - Dr. K. WADACHI.
2. Chief of the Research Division - Dr. K. HIDAKA.
3. Chief of the Investigation Division - Dr. H. ARAKAWA.

Oceanography Section: Dr. K. HIDAKA, in charge; Dr. Y. TAKENOCHI, Oceanographer; Dr. S. YOSHIMURA, Oceanographer and limnologist; Dr. Y. MIYAKE, chief chemist; Dr. S. WADA, Biologist; Mr. N. WATANABE, physical oceanographer; Mr. M. HARAGUCHI, oceanographer and meteorologist; Mr. K. NAKANO, vessel captain, Mr. H. KOSUGE, marine engineer.

Provision for Publication of Results: Monthly and annual reports of Meteorological Observations in Japan; Monthly Weather Review; Geophysical Magazine; Bulletin; Actinometric Bulletin; Solar Radiation; Tide tables-Short Report of results of observations on solar radiation made in Japan; Report of Magnetic observations; Report of Agricultural Meteorology; Report of Aerological Meteorology.

Comment: In 1944 the Navy transferred its Meteorological Department to quarters in the Central Meteorological Observatory. When Japan was occupied by American troops, the Observatory was placed under guard. Classified as a military objective, a considerable amount of meteorological equipment was confiscated. Oceanographic equipment, being the property of the Central Meteorological Observatory, was not disturbed.

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IMPERIAL FISHERIES EXPERIMENTAL STATION  
(SUISAN SHIKENJO)

History or Origin: Established in 1929.

## ENCLOSURE (B), continued

Location: Tsukishima, Kyobashi-ku, TOKYO.

Attached: Ministry of Agriculture and Forestry.

Purposes: Investigations, researches, and experiments on fisheries and their utilization.

Appropriation: ¥720,000 (Fixed annual grant).

Scope of Activities: Physical and biological oceanography, catching fish, fish culture, preservation of fish, utilization of fish and other marine products, development of fishing boats, etc. War service restricted to intensified attempts to develop deep water fishery.

Equipment: Laboratories and experimental stations; Head office of main station, TOKYO; 3 laboratory buildings; 1 experimental model basin (approximately 10 x 150 meters); 2 experimental factories; 1 freezing room for experiments. New building expansion planned for 1947, to permit increased work on problems of the fishing industry. One station vessel, the SOYOMARU, 202 tons.

Branch Stations: Three previous branch stations were abolished, the KISAKI station in 1937, the TOYOHASHI and OCHIO stations in 1940, because the locations were not best suited to the work required and because prefectural Fishery Experiment Stations had taken cognizance as needed.

The KASAOKA Station, staff of five persons, has been continued for shell-fish culture only in OKAYAMA Prefecture.

Two new branches have been established.

1. UEDA (1937) station in NAGANO Prefecture for fresh water fish culture. Seven persons on staff.
2. NANAO (1939) station in ISHIKAWA Prefecture for the development of marine products in the Japan Sea. Five persons on staff.

Staff: Total personnel approximately 120, including the crew of vessel.

Scientific staff of 21 experts and 14 assistants.

Director, Dr. N. KASUGA.

Fishing, M. SAKAI.

Fish Technology, Kintaro KIMURA, H. HIGASHI, and K. TANII.

Pisci-culture, S. NAKANO and S. FUJIMORI.

Physics, I. GENSHO.

Chemistry, M. MEGITA, D.Sc.

Biological Oceanography, Dr. Kinosuke KIMURA.

D.Sc., and Dr. T. HANAOKA.

Physical Oceanography, D. KIMURA.

In charge of machinery, Dr. I. GENSHO.

Biology, T. SHIMAZU.

Branch stations: KASAOKA, D. KUSAKABE; UEDA, M. KAWAJIRI; NANAO, Y. SUEHIRO.

Captain, M.S. SOYO MARU, K. IMAMURA.

In charge of fishing boat, S. KURITA.

Provision for Publication of Results: Journal of the Imperial Fisheries Experiment Station; Fisheries Investigation (Supplementary Report); Semi-annual Report of Oceanographical Investigation; Monthly Oceanographical Chart (in sheet).

Vessel Operations: The ocean survey vessel SOYOMARU engaged in ocean investigations in connection with the fisheries. The Navy on occasions request-

ENCLOSURE (B), continued

ed that observations on physical oceanography be made in connection with the institutions' own program. This was optional with the Institute, however, as the vessel was at no time placed at the disposal of the Navy. In this respect it was unique - all vessels of other institutions were pressed into naval service when their services were required. The following observations were recorded in Navy records:

SOYOMARU

5/19 - 7/2/38	118 stations in TOKYO-NANSEI SHOTO area.
6/4 - 8/2/39	148 stations in TOKYO-So. China Sea.
8/22 - 9/22/39	84 stations in TOKYO-N. KURILES.
4/22 - 5/29/40	116 stations in S.HONSHU-BORNEO.
2/5 - 2/22/41	29 stations in TOKYO-HOKKAIDO.
2/27 - 3/5/41	22 stations in TOKYO-KYUSHU-GUAM (in cooperation with 9 other vessels).

(Total 517 stations)

Effect of War on Operations: The institution continued operations throughout the war. The work of the SOYOMARU was greatly reduced but not completely stopped. No services were performed for the Army or Navy other than acquisition of oceanographic data. The wartime objective of the laboratory was to increase the fishery, and special work consisted principally of experiments on deep sea fishing to 1000 meters by long-line trawls. The semiannual reports were published until October 1943, and the Journal and supplementary report until March 1943.

Routine coastal observations supplied by prefectural vessels have continued without interruption, but material since 1943, when the last data were published, has remained unorganized.

Studies on the texture of the bottom were made some 20 years ago and published in Institute reports. There have been no studies on animal sounds, fouling, or other subjects not applicable to the fishery.

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IMPERIAL FISHERIES INSTITUTE  
(SUISAN KOSHUJO)

Origin: Established in 1897.

Location: 8 Eichujima, Fukagawa, TOKYO.

Organization to Which Attached: Ministry of Agriculture and Forestry.

Purpose: Education in science and art of the fisheries and the study of the profound theories on them, along with the formation of character.

Scope of Activities: Fishing, technology of fisheries, pisci-culture, physics and chemistry, mechanics, oceanography, zoology and botany, and bacteriology, economics and laws.

Equipment: Two main buildings, including 51 classrooms, 42 laboratories, a large auditorium, and 40 other rooms.

Vessels: UNYOMARU, a training ship used for instruction in seamanship.  
 SHUNKOTSUMARU, a training ship of 500 tons borrowed from the Ministry of Agriculture and Forestry.  
 SHINYOMARU, a trawler of 480 tons used for training in fishery methods.  
 (The former training ship HAKUYOMARU was sunk by an Allied submarine in Borneo waters in March 1944 while serving as a Navy transport. It had been assigned to the Navy in February 1943).



## ENCLOSURE (B), continued

Branch Stations:

1. Training station at TATEYAMA Bay, CHIBA Prefecture, used for training and experimental Purposes.
2. Marine Biological Laboratory at KOMINATO Bay, CHIBA Prefecture, used by students of pisci-culture. (See KOMINATO Marine Biological Laboratory).
3. Training Station at YOSHIDA, SHIZUOKA Prefecture. Research on rearing of warm water fish.
4. Training Station at OIZUMI, YAMANASHI Prefecture. Research on rearing of cold water fish.
5. Training Station at NUMAZU, SHIZUOKA Prefecture. Research and training of students of technology.
6. An oyster experimental station at KANAZAWA, KANAGAWA Prefecture, has been abolished and possible transfer to CHIBA is under consideration.

Appropriation: (Yen)

<u>Year</u>	<u>Regular Budget</u>	<u>Special Work</u>	<u>Total</u>
1940	437,880	76,169	564,049
1941	532,841	57,588	590,427
1942	539,754	23,198	562,952
1943	567,949	100,909	668,858
1944	620,131	56,501	676,632
1945	725,671	662,807*	1,388,478

Staff: Director, Yasukichi SUGIURA.

Fishing Laboratory: Professors T. TANAKA, J. IHARA, T. SASAYAMA, Dr. H. KUSAMA, T. ARIHARA. Assistant Professors TAKIGUCHI, KANDA, SUDO.

Technological Laboratory: Professors Y. MIYAMA, Dr. Y. SHIMIZU, T. KAWAGUCHI, S. IWAMOTO, Dr. KIMATA, K. SARUYA. Assistant Professor S. KAWAKAMI.

Pisci-Cultural Laboratory: Professor Dr. J. HORI.

Physical Laboratory: Professor M. TAUCHI, Assistant Professor K. MIYOSHI, Instructor, Dr. S. KAMIYA.

Chemical Laboratory: Professors D. AGR, T. OYA, Y. MATSUIKE, D.Sc., Dr. I. IKADA.

Mechanical Laboratory: Dr. K. TOMIMASU.

Oceanographical Laboratory: Dr. H. NIINO.

Zoological Laboratory: Professors K. EBINA, Dr. T. MIMURA, Dr. D. INABA, K. MATSUBARA. Assistant Professor Dr. I. KUBO, I. MATSUI.

Botanical Laboratory: Professor Dr. S. UEDA; Instructor Dr. K. ONDA.

\*Large appropriation for special work in 1945 was for the following purposes:

1. Repair of Kominato Laboratory, damaged by a tidal wave following an earthquake in the spring of 1944.
2. Conditioning of the old training ship SHUNKOTSU MARU, borrowed from the Bureau of Fisheries to replace the HAKUYO MARU.
3. Establishment of an oyster culture station at ANEGASAKI, Chiba Prefecture.
4. Accommodation of classes in navigation and fisheries which had increased 50%.

*ENCLOSURE (B), continued.*

Bacteriological Laboratory: Professor T. MIURA, Dr. S. TANAHASHI  
F. KATAYAMA, Y. KOISHI, Dr. S. OKAMOTO. Experts: T.  
KUMEGORI, S. TSURUDA, YAMAGUCHI.  
Pelagic Fishery: Professor T. FAJIMA.

Provision for Publication of Results: The results of studies in the Institute are published in the "Journal of the Imperial Fisheries Institute."

Vessel Operations: The Institute utilized its vessels solely for student training cruises and never took ocean data except when requested by the Navy, in which case the Navy sent its own investigators to make observations and return results to the Hydrographic Department, TOKYO. The two vessels were used in these areas:

HAKUYO MARU: (Prior to being sunk in March 1944).  
2/1-22/39, 24 stations in the Yellow Sea.  
11/23/40 - 1/9/41, 73 stations in the China Sea - Gulf of Siam.  
10/12 - 12/3/42, 113 stations in the East Indies - South China Sea.

SHINYO MARU  
1/28 - 3/24/43, 167 stations in NANSEI SHOTO-FORMOSA.

Present Status: A part of the buildings were occupied by the Seventh Cavalry Squadron on 21 December, 1945.

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MISAKI MARINE BIOLOGICAL STATION  
(MISAKI RINKAI JIKKENJO)

History or Origin: Founded in 1885.

Location: About 60 km south of TOKYO, Kojiro, Misaki-machi, Miura-gun, Kana-gawa-ken.

Organization to Which Attached: Imperial University, TOKYO.

Purposes: Research by investigators associated with the laboratories and institutes of zoology, botany, fisheries, and medical sciences of the University, and visiting investigators; laboratory for college students of zoology; summer courses; staff and students of Biology Dept. of Faculty of Science and Fishery Dept. of the Faculty of Agriculture.

Scope of Activities: Marine biology, oceanography, and allied sciences. Aquarium and museum are open to the public; summer courses in marine zoology for public and high school teachers; oceanographic observations; seismological observations; research facilities extended to visiting investigators. At present (Jan. 1946) the aquarium is closed.

Equipment: One laboratory building, reinforced concrete, 59 x 13.5 meters, with floor space 1000 square meters including chemical, physiological, and oceanographical rooms besides general laboratory; 1 office and laboratory, wood, 12 x 9 meters; 1 aquarium-museum building, reinforced concrete, 2 stories, 29.7 x 7.2 meters, with floor space 363 square meters; 1 seismograph room; 3 dormitories, including residence for overseas investigators; 1 wooden cottage for staff; 1 motor boat; 3 row boats.

Staff: Director, Dr. Y. K. OKADA; resident chief, Dr. K. KIKUCHI; Assistant, T.T. IIDA; Lecturer, K. DON, and seven assistants.

Provision for Publication of Results: Journal of Faculty of Science, Section IV, Tokyo Imperial University.

ENCLOSURE (B), continued

Effect of the War on Operations: The station was not used for research work after February 1945, when it was offered for the use of the Japanese Navy. All records were removed to Tokyo Imperial University. In January the property was returned to the University by U.S. Military Forces, and preparations are being made for complete resumption of operations soon. Dr. K. DON is at present (March 1946) in residence at the laboratory.

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KOMINATO MARINE BIOLOGICAL LABORATORY

Location: On the sea shore of KOMINATO Bay, about 1.6 km south of Awa-Kominato Railway Station, CHIBA Prefecture, and about 121 km from TOKYO via the Boso Railway Line.

Organization to Which Attached: Imperial Fisheries Institute, TOKYO.

Purposes: Research and instruction in marine biology.

Scope of Activities: Researches in biology, under which planktology, biology of fishes are included; chemistry and physics of sea water; dynamical oceanography.

Equipment: Total site 5000 square meters; 1 re-enforced concrete laboratory building, including aquarium, 2 floors, 165 square meters. First floor aquarium with 11 tanks; second floor laboratory; 1 wooden dormitory, 2 floors, 121 square meters, 1 wooden bath house, building area 9.9 square meters; 2 wooden cottage residences; 2 engine houses; 1 fish pond, about 40 x 20 x 8 feet; sea water tank, about 24,000 gallons capacity, re-enforced concrete structure; boat house; 1 re-enforced concrete pier, about 20 feet x 5 feet; 1 research boat; library, about 200 volumes, 100 reprints.

Staff: Director, Dr. HORI (Remains at TOKYO).

Local Members:

Asst. Prof. T. INO.

Asst. NAKAMURA.

The investigations also receive help in research from members of the Fish Culture Department of the Imperial Fisheries Institute and visitors from other institutions.

Provision for Publication: Bulletin of the Japanese Society of Scientific Fisheries, issued in care of the Imperial Fisheries Institute.

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ONAGAWA FISHERIES AND OCEANO-CHEMICAL LABORATORY

History or Origin: First established in 1933 as the Oceano-chemical Laboratory of the Chemical Institute of Tohoku Imperial University. In 1940 when an Agricultural Institute was established in the University, the Fisheries Laboratory was added at ONAGAWA.

Location: ONAGAWA, Ojika-gun, MIYAGI Prefecture.

Organization to Which Attached: Chemical Institute and Agricultural Institute (Fisheries Division) of Tohoku Imperial University.

Purposes: Research in Oceanography and Fisheries biology.

## ENCLOSURE (B), continued

Scope of Activities: Research on life histories and methods of artificial culture of invertebrates and flat fishes. Genetics of Ostrea signa.

Equipment: Two laboratory buildings, 1 story, floor area of large building 484 square meters, small concrete building 192 square meters; 14 rooms of which 8 are for biological research and 2 for chemical research, library, office, directors' room and dark room. One dormitory, 1 story, 8 rooms. No student accommodations. Capacity 10 investigators. Air, gas, electricity, running fresh and sea water. One greenhouse and 17 outdoor culture tanks of concrete.

Vessels: One survey ship, KOGANE MARU, 13 tons, 35 hp diesel engines. One row boat.

Staff: In charge, Dr. Takeo IMAI, 3 assistants, 2 laboratory aides.

Provision for Publication of Results: Reports of the Agricultural Institute (Fisheries Division) and Science Reports (Fourth Series) of Tohoku Imperial University.

Comments: In aircraft bombing attacks on 9 and 10 August 1945 on Navy vessels nearby, all laboratory windows were broken and a motor boat (2 tons) was destroyed, but the contents of the laboratory were not damaged.

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MIYAKO METEOROLOGICAL OBSERVATORY

History or Origin: The Observatory was established in 1936. The principal object is to observe the temperature of sea water off the east coast of N. Japan every day when the weather permits.

Location: MIYAKO. 39°38'N. 141°59'E.

Organization to Which Attached: The Central Meteorological Observatory, TOKYO

Purposes and Scope of Activities: Meteorological and Oceanographic observations.

Equipment: Besides a small laboratory for marine chemical work, the observatory operates a motor yacht, MS KUROSHIOMARU, 28 tons, and 6.8 knots in speed, length 18 meters

Staff: Director, Y. TSUJI.

Publication: The results of observations made at this observatory are published in the publications of the Central Observatory, TOKYO.

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HACHINOHE METEOROLOGICAL OBSERVATORY

History or Origin: The observatory was established for observations in the HACHINOHE area to a point 20 miles offshore.

Location: HACHINOHE, AOMORI Prefecture, 60 miles north of MIYAKO.

Purposes and Scope of Activities: Daily observations in HACHINOHE area, and occasional expansion northward to CAPE ERIMO and MURORAN, Hokkaido. Oceanographic data acquired: temperature, salinity, waves, transparency, water color, chemical analyses (phosphate and silicate) and plankton (to be started).

## ENCLOSURE (B), continued

Vessel: MS OYASHIOMARU, 17 tons, 30 hp, speed 6 knots, length 15 meters, built in 1936 and equipped with 2 hand sounding machines.

Comment: This institution was not visited by representatives of NavTechJap. The above incomplete record has been taken from "Science of the Ocean", Vol. 1, No. 3, 1941.

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MARINE BIOLOGICAL STATION OF ASAMUSHI

Origin: Since its establishment in 1924, the station has been an important center for marine biological research, some 200 papers having appeared by 1941.

Location: ASAMUSHI, AOMORI-ken, about 16 km northeast of city of AOMORI.

Organization to Which Attached: The Faculty of Science, Tohoku Imperial University.

Purposes: Major purpose, research; instruction in zoology, physiology, and planktology.

Scope of Activities: Research in physiology, zoology, physiological chemistry, planktology, and oceanography.

Equipment:

## One laboratory building:

Two floors, 386 square meters, of 14 rooms: 8 research rooms for faculty, student laboratory, physiological laboratory, library, dark room, reception room, janitor's room; all furnished with gas, electricity, running sea and fresh water. (The undersea laboratory was abandoned after being damaged by stormy seas.)

## One aquarium house:

Re-enforced concrete, 238 square meters, business room, aquarium, museum. 24 tanks of various sizes, in which both fresh and sea water fishes are on display to the public.

## One boat house:

Seventy square meters, 1 small fishing boat, portable motor.

## Two motor boats:

One, 8 meters, 20 hp gasoline engine, furnished with fish tank for transporting live fishes; one 7 meters, 8 hp engine.

## One dormitory:

Two story frame building, capable of accommodating 50 persons, area 636 square meters.

## Four official residences:

116 square meters each, of 3 to 5 rooms.

Staff: Director, Dr. S. HOZAWA; Curator, Dr. S. KOKUBO; 3 assistants; 1 technical assistant.

Provision for the Publication of Results: Scientific reports of Tohoku Imperial University, B Series.

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## ENCLOSURE (B), continued

HAKODATE MARINE OBSERVATORY  
(HAKODATE KAIYO KISHODAI)History or Origin: Established in August 1942.Location: AKAGAWADORI, Kameda-Mura, Kameda-Gun, Hokkaido, Japan.Organization to Which Attached: The Central Meteorological Observatory.Purpose: Research on Marine Meteorology and Oceanography.Scope of Activities: Marine observation; meteorological observation; and research.Equipment: In the Observatory, two rooms for research. In the Branch Office, one small room for research. One residence for visitors. An observing ship, YUSHIO MARU, of 150 tons.Staff: Scientific: M. NAKANO, Dr. Sc., Meteorologist (tides), Director; T. TAMURA, Oceanographer (Plankton); R. TAGUCHI, Assistant (marine meteorology).Provisions for Visiting Investigators: No special provisions.Income: Sources: The Central Meteorological Observatory. Amount: Not fixed.Provision for Publication: Hakodate Kaiyo Kishodai Kaiyoshiho, (Oceanographic observations made by the Hakodate Marine Observatory).Hakodate Kaiyo Kishodai Yoho. (Scientific report of the Hakodate Marine Observatory).

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OCEANOGRAPHIC DIVISION,  
THE INSTITUTE OF LOW TEMPERATURE SCIENCEEstablished: 1941.Location: SAPPORO, Hokkaido.Organization to Which Attached: The Institute of Low Temperature Science, Hokkaido Imperial University.Purpose: Physical Oceanography research.Scope of Activities: Research in oceanography, especially sea-ice, sea-fog, and oceanographic instruments.Equipment: A part of building made of concrete and wood, 200 square meters, 2 floors including 1 Low Temperature Room (0-40°C); 4 staff laboratories; 1 laboratory for investigators. (Now occupied by U.S. Army excepting 1 low temperature room and 1 staff laboratory).Staff: One Professor (Takaharu FUKUTOMI). Six Research Assistants (5 temporary).Income: ¥4000 for 1945, from the Institute of Low Temperature Science.

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ENCLOSURE (B), continuedAKKESHI MARINE BIOLOGICAL STATION

Origin: Established 1931.

Location: On the sea front of the gulf AKKESHI, about 70 km east of KUSHIRO and 150 km west of NEMURO.

Organization to Which Attached: The Faculty of Science, Hokkaido Imperial University.

Purpose: Research, instruction for students.

Scope of Activities: Research in biology and oceanography.

Equipment:

One concrete building:

788 square meters, 3 floors including one student laboratory; 1 laboratory for investigators; 5 staff laboratories; 1 aquarium room of 10 tanks; 1 library; 1 public room; 1 office; 1 motor room; 1 small motor boat; 2 wooden residences.

Staff: Dr. Tohru UCHIDA, Director.

Mayumi YAMADA and Wazumi KUBO, (Temporary) Associates.  
Professor Shiro OKUDA, Assistant.

Provisions for Publications of Results: "Journal of the Faculty of Science." Hokkaido Imperial University.

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OSHOBO MARINE BIOLOGICAL STATION

Location: OSHORO village, about 15 km southwest of OTARU Harbor.

Organization to Which Attached: Institute of Fisheries, Faculty of Agriculture, Hokkaido Imperial University.

Purpose: Teaching and research; marine biology and oceanography.

Scope of Activities: Classes in marine zoology (10 days), marine botany (10 days), planktology (7 days), oceanography (7 days), embryology (7 days). Research by staff.

Equipment: Grounds, 9100 square meters; main building, 340 square meters; first floor - main laboratory room for students, 4 small laboratory rooms for staff members, aquarium room, store room, kitchen, lavatory, bathroom, and 3 private rooms for keeper. Second floor has four bedrooms. Two storehouses, 170 square meters.

Staff: Director, Professor S. SAITO. There is no full-time staff.

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INSTITUTE OF ALGOLOGICAL RESEARCH  
(KAISO KENKYUJO)

History or Origin: Established in May, 1933. A new laboratory was completed in April, 1937.

Location: Funami-cho, MURORAN, Hokkaido, Japan.

Organization to Which Attached: The Hokkaido Imperial University.

*ENCLOSURE (B), continued*

Purpose: Research works on the marine algae.

Scope of Activities: Systematic, cultural, physiological, and ecological studies on marine algae. Year-round research; entirely botanical.

Equipment: In the laboratory, one large and two small rooms for research, three rooms for culture studies; two small boats; a lodging for visitors.

Staff: Scientific: Y. YAMADA, Professor of Botany, Hokkaido Imperial University; Y. NAKAMURA, Assistant. Technical and clerical, 1. Maintenance and operation, 2.

Provisions for Visiting Investigators: No special provisions.

Income: Sources: The Hokkaido Imperial University. Amount: Not fixed.

Provisions for Publication of Results: "Journal of the Faculty of Science", Hokkaido Imperial University.

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SHIMODA MARINE BIOLOGICAL STATION

History or Origin: Established in 1933.

Location: SHIMODA-MACHI, Shizuoka-Ken, Japan.

Organization to Which Attached: Tokyo University of Literature and Science.

Purpose: Research; instruction in zoology, botany, oceanography, geography, et cetera, and science education on the marine subjects.

Scope of Activities: At present limited to zoological research but as soon as possible it is intended to continue the following: investigations in physiology, biochemistry, ecology, experimental studies of animals and plants, meteorology, oceanography, geography, geology, terrestrial magnetism, earth current, atmospheric electricity, etc.

Equipment: Sea-water and fresh-water are supplied for every laboratory. Two gasoline motor boats (16 and 5 hp) and four collecting boats. An aquarium is attached. Some damage was suffered by the establishment due to Japanese military occupation.

Staff: Director, Dr. TAKATSUKI. Assistant, Dr. E. SAWANO. Mr. NAKAJIMA, demonstrator, is at present on leave.

Provision for the Publication of Results: Tokyo Bunrika Daigaku (University of Literature and Science), "Science Reports".

War Record: No work was carried on due to the occupation of Japanese coastal defense units.

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MITSUI INSTITUTE OF MARINE BIOLOGY

History or Origin: Established and opened in 1933 by Mr. Takanaga MITSUI.

Location: SUSAKI Near SHIMODA, Kamo-gun, Shizuoka Prefecture.

Organization to Which Attached: Independent institution.



*ENCLOSURE (B), continued*

Purposes: Research in marine biology.

Scope of Activities: Researches in marine biology in general, planktology, algology, physiology, and oceanography; biological survey of the neighboring waters, especially of deep-sea fauna, of SURUGA Bay.

Fellowships were awarded annually prior to the war by the committee of the Institute to research workers desiring to investigate marine material in the Institute.

Equipment: One laboratory building, reinforced concrete, 2 floors, 297 tsubo (1 tsubo - 6 x 6 feet), of 25 rooms; 9 research rooms, 2 libraries, 3 store rooms, 2 constant temperature rooms, 2 seismological observatories, office public hall, museum, engine room, aquarium room, boat house, janitor's room; all furnished with running sea and fresh water; 1 small motor boat and a few row boats for collection and oceanographical observation.

Staff: Scientific: Director (changeable by 3 years' term) Prof. Inusaku AMEMIYA, TOKYO Imperial University (1936-). Permanent staff: Otohiko TANAKA (oceanography and planktology); Sokichi SEGAWA (on leave at present) (algology). Naturalist: Kojiro KATO (zoology, on leave at present). Technical and clerical: Clerk, Daisaku SAKATA. Maintenance and operation: 2 collectors and 2 attendants.

Provisions for Visiting Investigators: At least three can be accommodated.

Income: Sources: Provided from a grant by Mr. Takanaga MITSUI. Future amount uncertain.

War Record: Closed in 1943. The clerk, D. SAKATA, maintained the building for student use until February 1946, when the Laboratory was reopened under the Directorship of Prof. AMEMIYA. The prewar staff will be reappointed.

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SUGASHIMA MARINE BIOLOGICAL STATION

History or Origin: Established in 1941.

Location: SUGASHIMA, Mie Prefecture.

Organization to Which Attached: Faculty of Science, Nagoya Imperial University.

Purpose: Research.

Scope of Activities: Biological research in local waters.

Equipment: One laboratory, 308 square meters; one dormitory, 178 square meters; one motor boat; three row boats.

Staff: Director, Dr. Yuji SHIBATA (Geochemist). Assistants, Dr. M. SUGIYAMA, Dr. K. SUGAWARA, (Geochemists). Postgraduate student, Miki AKINO.

Provisions for Publication of Results: As yet there have been no publications.

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IMPERIAL MARINE OBSERVATORY, KOBE

Origin: Established in 1919.

Location: 7 Chome, Nakayamete-Dori, KOBE.

Attached: Central Meteorological Observatory. Department of Transportation.

Purposes: Marine meteorology and oceanographic investigations.

Equipment: Nine sections. (About half of the buildings were destroyed by U.S. air raids).

1. Navigation Section - completely destroyed.
2. Weather Chart Section - completely destroyed.
3. Marine Meteorological Section - partially destroyed.
4. Physical Oceanography Section - slightly damaged.
5. Chemical and Biological Section - slightly damaged.
6. Meteorological Observation Section (inland) - partially destroyed.
7. Instrument Calibration Section - partially destroyed.
8. Library - partially destroyed (oceanographic publications lost).
9. Ship (M.S. SHUNPU MARU), 124 tons, length 27.4 meters - partially damaged and now under repair.

Staff:

Dr. K. KOENUMA, Director and Physical Oceanographer.  
 Y. MATSUDAIRA, Oceanographer (biologist and chemist).  
 T. SHIBATA, Meteorologist.  
 Z. YASUI, Oceanographer.  
 Y. SAITO, Oceanographer.  
 N. YAMAMOTO, Meteorologist.  
 T. SHINOZAKI, Meteorologist.  
 G. HORIUCHI, Meteorologist.

Staff Members Killed in Air Raid:

T. SANO, Director and Meteorologist (acting in absence of Dr. UDA, who was in military service. Dr. UDA now on sick leave because of eye trouble).  
 Y. YANAGISAWA, Biologist.  
 Y. MINURO, Meteorologist.  
 M. KINOSHITA  
 The successive Directors of the Observatory from Dr. T. OKADA were Dr. Y. Horiguchi, Dr. M. UDA, Mr. SANO, and Dr. K. KOENUMA.

Present Status of Institution (February 1946): The vessel is undergoing repair. No building repairs have yet been undertaken. Plans for restoration have been prepared for submission at the next Diet, but its action cannot be predicted. Most of the stock of the Institution's publications were burned.

Provision for Publication of Results:

Annual Report.  
 Memoirs of the Imperial Marine Observatory.  
 Daily Weather Charts of the North Pacific.  
 Journal of Oceanography.  
 Tidal Observations.  
 Miscellaneous Reports of the Marine Observatory (Kaiyo Kishodai Iho).

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ENCLOSURE (B). continuedINSTITUTE OF PHYSICAL OCEANOGRAPHY

History or Origin: Established 1921.

Location: Imperial University, KYOTO, Japan.

Organization to Which Attached: Imperial University, KYOTO. (One assistant remains at the OSAKA Tidal Station.)

Purpose: Instruction and Research.

Scope of Activities: Physical Oceanography in general.

Equipment: Ordinary equipment for research in Physics.

Staff: All staff members are in the Department of Science at Kyoto Imperial University. Acting director, Yoshikazu TOYOHARA. Other members include Tohichiro TAKEGAMI, Kinzo SENO, Akikazu ODANI.

Income: About ¥3000 annually from the Government.

Provision for Publication of Results: In "Memoirs of the College of Science", Kyoto Imperial University, Series A. There have been no publications since 1932.

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SETO MARINE BIOLOGICAL LABORATORY  
(SETO RINKAI KENKUSHO)

Location: SETO-KANAYAMA, Wakayama, on the west coast of KII Peninsula, about 128 km south of OSAKA.

Organization to Which Attached: Faculty of Science, KYOTO Imperial University.

Purpose: Research work on marine biology; instruction to students of KYOTO Imperial University.

Scope of Activities: Researches in marine biology, including taxonomy, morphology, embryology, ecology, physiology, planktonology, et cetera; lectures, laboratory courses in marine biology for University students; special courses in marine biology for teachers of middle and primary schools, usually attended by about 30 persons; exhibit of marine life for public.

Equipment: Buildings are all wooden and one storied; 1 students' laboratory, 220 square meters; 1 research laboratory, 264 square meters; 1 dormitory, 395 square meters; 1 residence for resident members, 61 square meters; 2 motor boats "PELAGIA", "JANTHINA"; 3 row boats; 1 library, 15 square meters; 1 aquarium bldg., 18 square meters, 1 museum, 400 square meters.

Staff:

Director, Dr. T. KOMAI.  
Lecturer, Fujio UCHINOUMI.  
Assistants, K. NOZAWA, N. TAKEDA.  
Technical Assistants, T. HABE, Miss T. KASUYA.  
Janitor and Cook.

Provisions for Visiting Investigators: Ten at most; usually about five.

*ENCLOSURE (B), continued*

Provisions for Publication of Results: Mostly in "Memoirs of College of Science", University of Kyoto, also in other journals.

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ONOMICHI MARINE BIOLOGICAL LABORATORY

History or Origin: Established in 1939.

Location: ONOMICHI, on the Inland Sea, HONSHU.

Organization to Which Attached: Hiroshima Imperial University.

Purposes: Marine biological research.

Scope of Activities: Chiefly studies on the local marine fauna. Open all year.

Equipment: One building, 1 motor boat.

Staff: Director, Dr. I. TAKI (Biologist), 1 assistant.

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AMAKUSA MARINE BIOLOGICAL LABORATORY  
(AMAKUSA RINKAI JIKKEN JO)

History or Origin: Established in 1928.

Location: Tomioka, AMAKUSA, KUMAMOTO KEN, Japan, about 31 km southeast of NAGASAKI.

Organization to Which Attached: KYUSHU Imperial University.

Purposes: Researches by investigators associated with the laboratories and institutes of zoology, botany, physiology, biochemistry, anatomy, and pathology of the University, and of other universities and colleges.

Scope of Activities: Chiefly the survey of the marine fauna and flora around TOMIOKA and its vicinity. Casual visitors may take up any field of research in marine biology, oceanography, and other related branches of science.

Equipment: One wooden laboratory, 2 stories, floor area 100 square meters; 1 janitor's house and kitchen, 1 story, 66 square meters; 1 dormitory, wooden, 100 square meters; Land area about 62,000 square meters; laboratory partially destroyed by aircraft bombing followed by storm damage. No repairing yet considered. Janitor's house damaged.

Staff: Director, Professor H. OSHIMA. Member of council, Professor R. KOKETSU. (One member, a professor in Kyushu Imperial University); one administrator; one assistant; one janitor; part time collectors and helpers. Scientific investigators are members of the Science Faculty and the Fisheries. Director, Professor H. OSHIMA, will resign in March due to age. (61 or 62 years age limit in Japan). The new Director will be selected from eligible senior Professors; probably Dr. K. UCHIDA or Prof. J. OYAMA.

Income: Not fixed.

Provision for the Publication of Results: "The Journal of the Department of Agriculture of Kyushu Imperial University", and "Zoological Magazine of the Zoological Society of Japan", are used mostly but some are published

in "Records of Oceanographic Works in Japan".

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FISHERIES RESEARCH STATION (Formerly the Fisheries  
Experiment Station of the Government-General of CHOSEN)

History or Origin: Established in May 1921.

Location: FUSAN, Korea.

Organization to Which Attached: The Government-General of CHOSEN.

Purposes: Scientific researches in Oceanography, Marine Biology, and aquatic products for the promotion of the Fisheries.

Scope of Activities: CHOSEN and its adjacent waters.

Equipment: Main building in FUSAN consists of laboratories for (a) fishing research and the study of suitable fishing boats, (b) chemical and physiological researches, (c) biological and aquicultural researches and (d) oceanographical researches. One small building was added during the war for investigations on the biology of mud flats.

Research vessels: (a) MISAGO MARU, a steel motor boat of 153 tons for oceanographical observation, (b) OTORI MARU, a wooden motor boat of 40 tons and (c) HAYABUSA MARU, a wooden motor boat of 31 tons, both for fishing researches. These vessels were not damaged in the war.

Branch Station at CHINKAI for fish culture had (a) biological laboratory and (b) ponds for fresh water fish culture.

Branch Station at SEISHIN (North Korea), for Fishery Industry studies; has (a) chemical laboratory and (b) factories.

Pre-War Organization: Branch Station at GENSEN. Fishery industry problems. Branch Station GINSEN. Propagation of edible bivalves on mud flats.

Head of the fishery department.

Head of the oceanographical department.

Head of the chemical and physiological department.

Head of the biological and aquicultural department.

Provisions for Visiting Investigators: No provision.

Provision for Publication of Results in the Past: Bulletin of Fishery Experiment Station of the Government-General of CHOSEN, Ann. Rept. of Hydrographic Observations, Oceanographic Charts, and other journals.

Post-War Status of the Station: As of 6 February 1946, five members of the wartime Japanese scientific staff were continuing their work as in the past, but under U.S. Military Government supervision. Seventy-five Koreans were also employed and operated under supervision of the Military Government. The station and its contents (apparatus, publications and records) are intact.

New Organization Plan:

Fisheries Research Station

President, Mon K. CHUNG. Advisor, K. FUJIKAWA (Japanese)

## ENCLOSURE (B), continued

## Main Station (FUSAN)

Industry Division: Head not yet chosen: Vice-chief C.H. CHANG;  
 Japanese Members: K. FUJIKAWA, K. KASHIWADA, M. WADA.  
 Fishery Division: Head not yet chosen. K.K. KIN.  
 Biology Division: Head, President T.E. CHUNG.  
 Economy Division: Head not yet chosen. A.P. AN.  
 Hydrographic Division: Head not yet chosen. S.K. NAN; Japanese:  
 K. NISHIDA and T. NAKAI.  
 General Affairs Section: Head, K.S. CHI.  
 Examination Division: Head not yet chosen.

Branch Station (TCHUNGJIN): Head not yet chosen.  
 Branch Station (WUNSAN): Head not yet chosen. I.T. CHUNG.  
 Branch Station (MOCPO): Head not yet chosen. T. KAN.  
 Branch Station (INTCHUN): Head not yet chosen. O.O. HAHU.

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FORMOSAN GOVERNMENT MARINE FISHERIES EXPERIMENT STATION  
 (KIIRUN)

Location On the seashore at SENTON, Kiirun.

Founded: 1922 by the Japanese Government.

Organization to Which Attached: Formosan Government Bureau of Fisheries.  
 Chief of Bureau of Fisheries serves also as Director of the Station).

Purpose: Oceanic Biology and Oceanography. Research on the Biology of Fishes and the Fisheries of the waters surrounding FORMOSA.

Scope of Activities: Investigation of fishing grounds, methods, and oceanographic work. Also, experimental fisheries work and fish culture; handling and shipping of fishery products.

Equipment: One main building, 2 residences (accommodations for 20 people), 1 cold storage building, 1 experimental factory for canning.

Vessels: One ocean-going steam vessel, SHONAN MARU, 500 tons.

Organization: Originally there were three divisions: Fishing (Oceanography), Fish Culture, and Manufacturing. After a recent reorganization the following divisions were established:

1. Biological Division (includes former Fish Culture branches).
2. Oceanographical Division (includes former Fishing Division).
3. Chemical Division (includes former Manufacturing Division).

Branch Laboratories:

1. Formosan Government Fresh Water Fisheries Experiment Station (TOYN). belongs to Fish Culture Division and is limited to pond culture problem.
2. Formosan Government Brackish Water Fisheries Experiment Station (ANPING, near TAINAN.) The Fish Culture Division is located here. (Culture of CHANOS (Forsk.) Oyster, Shrimp, and Crab.

## ENCLOSURE (C)

INDEX TO RECORDS OF OCEANOGRAPHIC SURVEYS OF THE HYDROGRAPHIC DEPARTMENT  
OF THE IMPERIAL JAPANESE NAVY

\* \* \* \* \*

1929 - 1944

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## Part I

RECORDS OF NAVAL OCEANOGRAPHIC SURVEYS

- (A) Naval Surveying Vessels. Assigned station numbers: 1-100.
- (B) Vessels Assigned for Use by the Navy. Assigned station numbers: 101-400.
- (C) Naval Oceanographical Observation Vessels. Assigned station numbers 401-500.
- (D) Fishing Vessels Chartered from Individuals. Assigned station numbers: 501-542.
- (E) Special Oceanographic Observations in SURUGA Bay.
- (F) Ocean Current Measurements. Stations 1C-6C.

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## Part II

CLASSIFICATION OF VESSELS USED IN NAVAL OCEANOGRAPHIC SURVEYS

- (A) Surveying Ships. Total used: 6.
- (B) Oceanographical Observation Ships. Total used: 6.
- (C) Ships Loaned by Other Government Agencies. Total used: 7.
- (D) Chartered Commercial Vessels (mostly whale catchers). Total used: 24
- (E) Chartered Small Fishing Vessels. Total used: 22.
- (F) Prefectural Fisheries Experimental Station Vessels. Total used: 30.

## ENCLOSURE (C), continued

Part I  
RECORDS OF OCEANOGRAPHIC SURVEYS  
 (NavTechJap Document No. ND50-5064.1-.29)

(A) Naval Surveying Vessels

Book No.	No. Stations	Vessels	Area	Period
1	179	MANSHU	FORMOSA-I. of HONSHU	7/31/29-8/6/31
2	168	YAMATO	So. JAPAN Sea	6/1/32-9/25/34
3	47	ITSUKUSHIMA	E. of TOKYO-Bering Sea	7/31-8/9/35
4	43	KOSHU	FORMOSA-MARSHALL ISL.	1/20-10/11/31
5	71	KOSHU	MARSHALLS-CAROLINES-HONSHU	4/10/32-8/23/33
6	150	KOSHU	All Mandated Island Areas	6/5/34-2/26/35
7	147	KOSHU	Mandated Island Areas	5/7-10/7/35
8	187	KOSHU	HONSHU-N. GUINEA-Long. 170°E	4/14-10/8/36
9	77	KOSHU	TOKYO-MARSHALL ISL.	12/7/36-3/1/37
10	96	KOMAHASHI	Off S.E. HONSHU	7/27/31-4/3/32
11	185	KOMAHASHI	TOKYO-E. of FORMOSA	1/15-4/12/33
12	240	KOMAHASHI	TOKYO-KURILES-CAROLINES	5/4-10/26/33
13	147	KOMAHASHI	N.E. HONSHU-MARIANAS	8/12/33-4/9/34
14	65	KOMAHASHI	KURILES-ALUTIANS (E. ADAX)	6/3-9/29/34
15	154	KOMAHASHI	E. PHILIPPINES-GUAM-N.	11/21/34-3/8/35
16	99	KOMAHASHI	HOKKAIDO-ALEUTIANS (E. to 180°)	5/20-9/10/35
17	115	KOMAHASHI	MARIANAS-W. CAROLINES	12/8/35-3/25/36
18	107	KOMAHASHI	HOKKAIDO-180°E, 55°40'N.	5/10-9/11/36
19	146	KATSURIKI	FORMOSA-I. PHILIPPINES	11/23/35-2/29/36
20	37	KATSURIKI	FORMOSA-W. PALAWAN	4/19-9/25/36
21	120	KATSURIKI	TOKYO-KYUSHU	12/10/36-2/9/37
22	52	KOMAHASHI	HONSHU-Saipan-MARCUS	10/16-11/17/36
23	28	KATSURIKI	FORMOSA-W. PALAWAN	3/31-8/30/37
24	156	KOSHU	TOKYO-GRIENWICH-MINDANAO	4/16-10/16/37
25	93	KOMAHASHI	HOKKAIDO-N. SAKHALIN- KAMCHATKA	4/22-6/23/37
26	61	KOMAHASHI	S.E. HONSHU-BONINS	7/28-8/16/37
27	162	KATSURIKI	S. of SHIKOKU & FORMOSA Channel	1/28-7/26/38
29	156	KOSHU	HONSHU-E. PHILIPPINES- PONAPE	2/1-8/24/38
30	76	KOMAHASHI	KYUSHU-TOKYO	10/25-12/19/38
31(a)	38	KOMAHASHI	SHIKOKU-TOKYO	1/9-24/39
31(b)	77	KOMAHASHI	KYUSHU-TOKYO	3/22-4/12/39
32	140	KOMAHASHI	SURUGA-MARIANAS-TOKYO	6/27-7/14/39
33	153	KOMAHASHI	SURUGA-NANSEI SHOTO-TOKYO	9/16-10/23/39
34	129	KATSURIKI	MARSHALLS-CAROLINES	7/1-12/5/40
35	120	KOMAHASHI	TOKYO-FORMOSA	2/2-3/20/40
36(a)	216	KOMAHASHI	S.E. HONSHU-IWO JIMA- FORMOSA	4/10-7/15/40
36(b)	68	KOMAHASHI	TOKYO-Saipan	7/26-8/17/40
37	137	KOMAHASHI	TOKYO-Saipan-FORMOSA	9/26-12/11/40
38	40	KOMAHASHI	TOKYO-KYUSHU	3/16-31/41
39	332	KOMAHASHI	TOKYO-GILBERTS-N. GUINEA	4/11-11/17/41
40	16	KATSURIKI	E. of BONINS-W. of WAKE I.	7/3-9/41
41	10	KYODO MARU	No. 3	8/18-27/41
42	3	KOMAHASHI	E. KURILIS	8/23-24/42
42	3	KATSURIKI	W. Coast of SIAM	5/1-6/42
43	11	Small Naval Boat No. 15	TSUGARU Straits	9/5-30/42



## ENCLOSURE (C), continued

(B) Vessels Assigned for Use by the Navy

Book No.	No. Stations	Vessels	Area	Period
101	13	KAIHO MARU	N.E. of HOKKAIDO	2/8-24/38
102	118	SOYO MARU	TOKYO-NANSEI SHOTO IS.	5/19-7/2/38
103	257	TAMA MARU Nos. 2, 3, 5, 6	TOKYO-NANSEI SHOTO- IWO JIMA	8/4-3/21/38
104A	148	SOYO MARU	TOKYO-So. CHINA Sea	6/4-3/2-39
104B	84	SOYO MARU	TOKYO-No. KURILES	8/22-9/22/39
105	24	HAKUYO MARU	Yellow Sea	2/1-22/39
105	73	HAKUYO MARU	CHINA Sea-Gulf of Siam	11/23/40-1/9/41
106	214	TAKUNAN MARU Nos. 1, 2, 3	KYUSHU-E. PHILIPPINES- PALAU	7/4-9/2/39
106	50	TAMA-MARU Nos. 5, 7	NANSEI SHOTO-YELLOW SEA	7/20-8/25/39
106	98	OSHOHO-MARU	HONSHU-MANDATED ISL.	7/25-9/7/39
106	106	KOMAHASI	HONSHU-MANDATED ISL.	7/25-8/25/39
107	71	KYO MARU No. 10	HONSHU-W. CAROLINES	7/25-8/23/39
107	70	TAMA MARU No. 3	HONSHU-W. CAROLINES	7/27-8/24/39
107	138	TCSHI MARU Nos. 2, 7	HONSHU-W. CAROLINES	7/24-9/1/39
107	139	TAKUNAN MARU Nos. 8, 10	HONSHU-W. CAROLINES	7/25-9/1/39
108	54	KYO MARU No. 6	KYUSHU-E. FORMOSA	6/27-7/14/39
108	85	KYO MARU No. 6	TOKYO-E. CAROLINES	7/24-8/25/39
108	56	KYO MARU No. 7	KYUSHU-N.E. LUZON	6/22-7/13/39
108	48	KYO MARU No. 7	TOKYO-E. CAROLINES	7/21-8/16/39
108	73	KYO MARU No. 8	TOKYO-TRUK I.	7/24-8/22/39
109	423	SOYO MARU & Pref. ves- sels	E. KURILES-N. CAROLINES- 163°E	8/1-9/11/40
110	15	KAIHO MARU	E. CHINA SEA	1/27-2/24/41
110	62	KAIHO MARU	CELEBES and JAVA Seas	1/9-2/8/41
110	65	KAIHO MARU	W. KURILES-BERING Sea	7/8-9/8/41
111	17	SHUNKOTSU- MARU	E. CHINA Sea (So. Part)	1/24-2/25/40
112	106	SOYO MARU	S. HONSHU-BORNEO	4/22-5/29/40
112	29	SOYO-MARU	TOKYO-HOKKAIDO	2/5-22/41
113	531	KAIYO Nos. 1, 2, 8	TOKYO-FORMOSA-20°N	7/13-8/18/40
(a, b)		Whale Ships		
114	300	10 Navy and other ves- sels	TOKYO-KYUSHU-GUAM	2/5-3/5/41
115	293	1 KAIYO and 4 whale ships	S. HONSHU-NANSEI SHOTO Isl.	5/29-7/1/41
116	310	KAIYO No. 2 and 4 whale ships	S. of HONSHU	5/26-7/2/41
117	424	SOYO MARU & 7 Pref. ves- sels	N., E. and W. of N. HONSHU	8/1-9/16/41
118	393	SOYO MARU & 6 Pref. ves- sels	JAPAN Sea, S. HONSHU- W. KYUSHU	4/27-6/15/41
119	350	8 KOREAN Govt. & 8 Pref. ships	So. JAPAN Sea-E. Yellow Sea	5/5-6/27/41

## ENCLOSURE (C), continued

Book No.	No. Stations	Vessels	Area	Period
120	488	15 Pref. Vessels	N. KURILES-FORMOSA-E. PHILIPPINES	8/1-27/39
121	176	YOKO MARU	CELEBES, JAVA & BANDA Seas	6/28-11/13/41
122	16	TOYAMA MARU	TOKYO-NANPO SHOTO	4/14-5/9/41
122	100	TOYAMA MARU	N. part South CHINA Sea	8/28-10/19/41
123	25	TANKAI MARU	TSUGARU ST.-So. HOKKAIDO	11/18-23/41
124	126	SANYO MARU	HOKKAIDO-NANSEI SHOTO	1/4-12/29/42
125	234	IWAKI MARU	S. and E. of HONSHU	1/7-11/18/42
126	100	RYOFU MARU	OKHOTSK Sea	7/1-8/21/42
127	222	7 Navy and other vessels	HOKKAIDO-W. LUZON-17°N.	8/11-9/6/42
128	251	4 small craft of Area Corps	BUNGO SUIDO	8/25-9/15/42
129	138	YOKO MARU	TOKYO-KURILES-E. to 172°E	3/4-5/16/42
130	113	HAKUYO MARU	E. INDIES-So. CHINA Sea	10/12-12/3/42
131	43	TOYAMA MARU	OKHOTSK Sea & KURILES	3/9-5/29/42
131	197	TOYAMA MARU	N. LUZON-N. GUINEA-MARIANAS	8/22/42-1/6/43
132	167	SHINYO MARU	NANSEI SHOTO-FORMOSA	1/28-3/24/43
133	155	SANYO MARU	E. of HONSHU	1/12-12/26/43
134	189	IWAKI-MARU	E. of HONSHU	1/20-12/21/43
135	164	TOYAMA MARU	S. of HONSHU & JAPAN Sea	4/20-9/1/43
136	74	SANYO MARU	E. of HONSHU	1/8-1/14/44
137	56	IWAKI MARU	E. of HONSHU	1/8-4/12/44

(C) Naval Oceanographical Observation Vessels. KAIYO Class

Book No.	No. Stations	Vessels	Area	Period
401	74	KAIYO No. 1	S. HONSHU-KYUSHU	11/6-12/21/39
402	184	KAIYO No. 1	S. HONSHU-KYUSHU	1/12-6/22/40
403	256	KAIYO No. 1	S. HONSHU-KYUSHU	7/3-12/24/40
404	307	KAIYO No. 2	South of HONSHU	1/16-6/29/40
405	288	KAIYO No. 2	South of HONSHU	7/4-12/27/40
406	211	KAIYO No. 1	S. HONSHU-KYUSHU	1/12-10/31/41
407	244	KAIYO No. 2	South of HONSHU	1/18-10/16/41
408	131	KAIYO No. 1	S. HONSHU-KYUSHU	10/1-12/25/42
409	141	KAIYO No. 2	South of HONSHU	10/18-12/16/42
410	37	KAIYO No. 3	E. FORMOSA-S. NANSEI SHOTO	10/6-14/42
411	40	KAIYO No. 4	N. NANSEI SHOTO-KYUSHU	10/2-9/42
412	184	KAIYO No. 1	South of HONSHU	1/5-5/6/43
413	109	KAIYO No. 2	FORMOSA	2/4-4/23/43
414	13	KAIYO No. 5	South of HONSHU	12/1-7/43
415	32	KAIYO No. 6	South of HONSHU	11/28-12/7/43
416	49	KAIYO No. 5	PARAMUSHIRO Channel	8/8-14/43
417	122	KAIYO No. 6	S.E. Part, OKHOTSK Sea	7/23-10/18/43

(D) Fishing Vessels Chartered from Individuals. Coastal Survey  
(All vessels station craft.)

Book No.	No. Stations	Area	Period
501	66	OSHIMA-HACHIJIMA	5/22-12/4/39
502	139	SHIMODA-OSHIMA	5/18-12/27/39
503	183	KII KATSU URA	5/26-12/25/39
504	249	SHIMIZU	3/24-12/22/39
505	277	ABURATSU	3/2-12/21/39
506	18	NAHA	10/28-12/10/39

## ENCLOSURE (C), continued

Book No.	No. Stations	Area	Period
507	74	SUO	9/7-12/27/39
508	258	ONAGAWA	6/28-12/21/40
509	226	ONABAMA	6/13-12/23/40
509(a)	222	ONABAMA	1/5-8/25/41
509(b)	125	ONABAMA	1/9-12/29/42
509(c)	196	ONABAMA	1/6-9/6/43
509(d)	11	ONABAMA	1/25-2/8/44
510	27	KATSU URA (CHIBA)	10/14-12/22/40
511	97	OSHIMA-HACHI JIMA	1/22-12/6/40
511(a)	75	OSHIMA	1/10-8/3/41
511(b)	108	OSHIMA	1/23-12/16/42
511(d)	123	OSHIMA	1/27-10/26/43
512	227	SHIMODA-OSHIMA	2/6-12/26/40
513	170	HAMASHIMA	6/20-12/12/40
513(a)	235	HAMASHIMA	1/14-12/25/41
513(b)	346	HAMASHIMA	1/14-12/24/42
513(c)	184	HAMASHIMA	1/6-11/14/43
514	320	KII KATSU URA	4/26-12/27/40
515	311	SHIMIZU	2/24-12/5/40
516	110	ABURATSU	1/10-12/21/40
517	211	NAHA	1/8-12/29/40
517(a)	137	NAHA	1/21-12/5/41
517(b)	241	NAHA	1/9-12/26/42
517(c)	172	NAHA	1/10-12/29/43
517(d)	17	NAHA	1/9-1/30/44
518	230	SUO	1/12-2/24/40
519	291	ONAGAWA	7/7-12/20/41
519(a)	261	ONAGAWA	1/11-12/22/42
519(b)	169	ONAGAWA	1/6-12/21/43
519(c)	25	ONAGAWA	1/14-5/3/44
521	78	KATSU URA (CHIBA)	1/15-12/25/41
521(a)	182	KATSU URA (CHIBA)	1/16-11/12/42
521(b)	151	KATSU URA (CHIBA)	1/21-11/15/43
521(c)	125	KATSU URA (CHIBA)	1/8-9/4/44
522	149	SHIMODA-OSHIMA	1/9-11/17/41
525	239	KII KATSU URA	1/6-12/24/41
525(a)	421	KII KATSU URA	1/15-12/22/42
525(b)	321	KII KATSU URA	1/5-12/23/43
525(c)	100	KII KATSU URA	1/8-8/30/44
526	176	SHIMIZU	1/14-12/22/41
526(a)	237	SHIMIZU	1/20-12/13/42
526(b)	155	SHIMIZU	1/25-11/29/43
526(c)	102	SHIMIZU	5/8-9/4/44
527	319	ABURATSU	1/15-12/20/41
527(a)	424	ABURATSU	1/8-12/20/42
527(b)	227	ABURATSU	1/27-12/18/43
527(c)	145	ABURATSU	4/15-9/1/44
528	203	KONIYA	1/15-12/25/41
528(a)	108	KONIYA	1/19-11/4/42
528(b)	55	KONIYA	2/10-12/14/43
530	206	SUO	1/16-12/25/41
530(a)	114	SUO	1/4-12/29/42
530(b)	172	SUO	2/18/43-1/12/44
531	11	FUSAN	5/22-23/43
532	172	SHIMODA	1/21-11/20/42
532	30	URAKAWA	8/20-11/26/43
532(a)	12	URAKAWA	3/19-4/2/44
533	28	KUSHIRO	3/15-8/25/44
534	8	HACHINOHE	11/14-15/43

## ENCLOSURE (C), continued

Book No.	No. Stations	Area	Period
535	148	SHINKO	5/13-12/20/43
536	21	KARATSU	9/28-12/22/42
536(a)	171	KARATSU	1/13-12/22/43
542	172	SHIMODA-OSHIMA	1/8-11/23/43
301*	68	MURATO	8/21-10/27/42
302*	128	MURATO	2/10-12/27/43

\*Numbers are 5556301 and 5556302 (last 3 digits used).

(E) Special Oceanographic Observations in SURUGA Bay. KAIYO Observation Vessels and Station Craft

Book No.	No. Stations	Vessels	Area	Period
A1	77	KAIYO Nos. 5, 6 and 3 other craft	SURUGA Bay near NUMAZU	4/24-27/44
A2	141	KAIYO Nos. 5, 6 and 2 other craft	SURUGA Bay near NUMAZU	5/2-13/44
A3	27	KAIYO Nos. 5, 6	SURUGA Bay near NUMAZU	6/25/44
A4	234	KAIYO Nos. 5, 6 and 1 other craft	SURUGA Bay near NUMAZU	7/23-24/44
A5	457	KAIYO Nos. 3, 5, 6 and 4	SURUGA Bay near NUMAZU	8/2-31/44
A6	270	KAIYO No. 3 and 1 other craft	SURUGA Bay near NUMAZU	9/1-30/44
A7	258	2 Navy station craft	SURUGA Bay near NUMAZU	10/4-31/44
A8	102	2 Navy station craft	SURUGA Bay near NUMAZU	11/1-17/44

Notes on the Investigations in SURUGA Bay  
by Dr. T. AKIYOSHI.

Location: ENOURA (N.E. coast), where the Naval Experimental Research Station was located.

Object: Oceanographic observations by the Hydrographic Department in connection with acoustic experiments. Work done at the request of the Experimental Research Station.

General Conditions: Depths vary greatly within the area. A river flows into the bay, causing inhomogeneous water in the northern vicinity near the river mouth. At times a branch of the Japan current (warmer water) enters, causing rapid changes in sea temperature in the area. Accordingly, currents, both horizontal and vertical, are complicated, though not strong.

Results: Complete echo soundings were made by the Hydrographic Department in connection with the oceanographic observations. No correlations could be found from the oceanographic data. Temperature, recorded to the second decimal point, is of little significance as thermal gradients, with respect both to time and place, are often exceedingly large. The data are of value chiefly in affording simultaneous observations on states of the sea at different times in the area.

## ENCLOSURE (C), continued

(F) Ocean Current Measurements

Book No.	No. Stations	Vessels	Area	Period
IC	6	KOSHU	South of Japan	5/18-24/32
IC	13	KOSHU	South of Japan	4/30-9/3/33
IC	19	KOSHU	South of Japan	6/5-12/26/34
IC	31	KOSHU	South of Japan	1/11-10/17/35
IC	5	KOSHU	South of Japan	2/2-2/16/38
IC	16	KOSHU	South of Japan	4/18-10/15/37
IC	15	KOSHU	South of Japan	5/7-8/10/38
IC	49	KOMAHASHI	N.E. to S.E. of Japan	2/1-10/3/33
IC	21	KOMAHASHI	N.E. to S.E. of Japan	12/7/33-9/26/34
IC	21	KOMAHASHI	N.E. to S.E. of Japan	11/26/34-3/6/35
IC	21	KOMAHASHI	N.E. to S.E. of Japan	5/22-12/28/35
IC	33	KOMAHASHI	KURILES-ALEUTIANS	5/10-9/11/36
IC	15	KOMAHASHI	KURILES-ALEUTIANS	5/6-8/16/37
IC	18	KOMAHASHI	Japan Current Area	11/21-12/17/38
IC	9	ITSUKUSHIMA	KURILES	7/14-8/2/35
IC	15	KATSURIKI	South of Japan	12/11/36-2/8/37
IC	7	KATSURIKI	South of Japan	1/29-2/10/38
IC	8	ODOMARI	South of Japan	2/10-5/7/38
2C(Pt.I)	40	KAIHO MARU & 8 others	South of Japan	2/10-10/7/38
2C(Pt.II)	6	3 Station Craft	South of Japan	4/9-10/11/39
2C(Pt.I)	66	KYO MARU No. 6 & 11 others	South of Japan	7/5-8/27/39
2C	69	KAIYO No. 1 & 10 others	South of Japan	4/11-11/17/40
2C	8	SHUNKOTSU MARU	South of Japan	1/10-1/25/41
2C	33	KAIYO Nos. 1&2	South of Japan	2/13-6/29/41
2C	200	KOMAHASHI	South of Japan	4/22-6/25/41
2C	157	TOYAMA MARU & 3 others	South of Japan	4/15-11/3/41
2C	233	KAIYO Nos. 1-4 and 7 others	South of Japan	3/21-11/30/42
2C	251	4 coast corps craft	BUNGO SUIDO	8/25-9/15/42
3C	186	8 station craft	Along Japan Current	2/27-12/22/40
3C	167	KAIYO No. 2 & 8 others	Japan Current Area	5/17-11/17/40
4C	268	SHUNKOTSU MARU & 11 others	Japan Current Area	1/13-12/14/41
4C	58	TOYAMA MARU	South of Japan	4/15-10/19/41
4C	16	HAKUYO MARU	South of Japan	8/25-10/7/41
4C	53	YOKO MARU	South of Japan	6/29-11/3/41
4C	19	SOYO MARU	South of Japan	2/10-5/10/41
4C	34	KAIYO Nos. 1&2	South of Japan	2/13-6/29/41
4C	99	KOMAHASHI	South of Japan	4/22-6/25/41
5C	101	12 station boats	Along Japan Current	1/18-12/16/42
6C	123	KAIYO Nos. 5, 6 & TOYAMA MARU	Japan Current Area	4/22-9/18/43

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## ENCLOSURE (C), continued

## Part II

VESSELS USED IN THE OCEANOGRAPHIC SURVEYS OF THE  
HYDROGRAPHIC DEPARTMENT(A) Surveying Ships

<u>Vessel</u>	<u>Tonnage</u>	<u>Owner</u>
KOMAHASHI	1,402	Hydrographic Department
KATSURIKI	1,942	Hydrographic Department
MANSHU	4,000	Hydrographic Department
YAMATO	3,000 ?	Hydrographic Department
KOSHU	2,080	Hydrographic Department
KYODO MARU No. 36		Hydrographic Department

(B) Oceanographical Observation Ships

<u>Vessel</u>	<u>Tonnage</u>	<u>Owner</u>
KAIYO No. 1	200	Hydrographic Department
KAIYO No. 2	200	Hydrographic Department
KAIYO No. 3	200	Hydrographic Department
KAIYO No. 4	200	Hydrographic Department
KAIYO No. 5	200	Hydrographic Department
KAIYO No. 6	200	Hydrographic Department

(C) Ships Loaned by Other Government Agencies

<u>Vessel</u>	<u>Tonnage</u>	<u>Owner</u>
RYOFU MARU	1,181	Central Meteorological Observatory
SOYO MARU	202	Imperial Fisheries Experiment Station
HAKUYO MARU	1,327	Imperial Fisheries Institute
SHINYO MARU	235	Imperial Fisheries Institute
KAIHO MARU	1,091	Bureau of Fisheries, Police Boat
SHUNKOTSU MARU	533	Bureau of Fisheries, Police Boat
OSHO RO MARU	471	Hakodate Fisheries College

(D) Chartered Commercial Vessels (mostly whale catchers)

<u>Vessel</u>	<u>Tonnage</u>	<u>Owner</u>
TAMA MARU No. 3	257	Taiyo Hogei Co.
TAMA MARU No. 5	257	Taiyo Hogei Co.
TAMA MARU No. 6	257	Taiyo Hogei Co.
TAMA MARU No. 7	257	Taiyo Hogei Co.
TAMA MARU	264	Taiyo Hogei Co.
TOSHI MARU	293	Taiyo Hogei Co.
TOSHI MARU No. 2	293	Taiyo Hogei Co.
TOSHI MARU No. 7	297	Taiyo Hogei Co.
TAKUNAN MARU No. 1	343	Nihon Suisan Co.
TAKUNAN MARU No. 2	343	Nihon Suisan Co.
TAKUNAN MARU No. 3	343	Nihon Suisan Co.
TAKUNAN MARU No. 5	343	Nihon Suisan Co.
TAKUNAN MARU No. 8	343	Nihon Suisan Co.
TAKUNAN MARU No. 10	343	Nihon Suisan Co.

## ENCLOSURE (C), continued

Vessel	Tonnage	Owner
SHONAN MARU No. 1	350	Nihon Suisan Co.
SHONAN MARU No. 3	350	Nihon Suisan Co.
SHONAN MARU No. 6	355	Nihon Suisan Co.
SHONAN MARU No. 7	355	Nihon Suisan Co.
KYO MARU No. 6	340	Kyokuyo Hogei Co.
KYO MARU No. 7	340	Kyokuyo Hogei Co.
KYO MARU No. 8	340	Kyokuyo Hogei Co.
KYO MARU No. 10	340	Kyokuyo Hogei Co.
TOYAMA MARU	914	Shimatani Kisen Co.
YOKO MARU	1,050	Sanko Kisen Co.

(E) Chartered Small Fishing Vessels

Vessel	Tonnage	Home Port
KINTOKU MARU No. 12	41	KUSHIRO
TOMI MARU No. 8	39	URAKAWA
SEITOKU MARU No. 1	32	HACHINOHE
YAYOI MARU	39	ONAGAWA
WADATSUMI MARU No. 2	39	ONAHAMA
ZENSHO MARU	34	KATSUURA (Chiba Pref.)
BISHAMON MARU	19	OSHIMA (IZU Is.)
TSUMEKI MARU	19	SHIMOKA
HOYO MARU	36	HAMASHIMA
NIKKO MARU	36	KATSUURA (Wakayama Pref.)
HIME MARU	34	MUROTO
DAIKICHI MARU	19	SHIMIZU
ISEYA MARU	18	KARATSU
KOUSEI MARU	19	ABURATSU
TORA MARU No. 6	32	KONIYA
HOURLI MARU No. 16	39	NAHA
KYOEI MARU No. 8	18	SUO (FORMOSA)
YAMATO MARU No. 3	18	SHINKO (FORMOSA)
DAIYOSHI MARU		FUSAN
KAEI MARU	25	HACHINOHE
KIYOTAKI MARU No. 2	19	SHIMODA
SHIGE MARU No. 3	19	SHIMIZU

(F) Additional Vessels used by Hydrographic Department

(Prefectural Fisheries Experimental Station Vessels.)

Ship	Prefecture	Ship	Prefecture
TANKAI	- HOKKAIDO	SHINYO	- MIE
SANYO	- HOKKAIDO	IWATE	- IWATE
GENKAI	- SAGA	HAKUCHO	- AICHI
AOMORI	- AOMORI	KAMOI	- NIIGATA
MIYAGI	- MIYAGI	KIYO	- YAKAYAMA
IBARAGI	- IBARAGI	KOCHI	- KOCHI
SHIMANE	- SHIMANE	HIUGE	- MIYAZAKI
TOTTORI	- TOTTORI	TATEYAMA	- TOKYO
CHOSHU	- YAMAGUCHI	MOGIMI	- YAMAGATA
IWAKI	- FUKUSHIMA	FUKUI	- FUKUI
TAJIMA	- HYOGO	TSURU	- FUKUOKA
SAGAMI	- KANAGAWA	TONAN	- OKINAWA
FUSA	- MIE	KAICO	- ?

SHONAN - FORMOSA Fisheries  
Experimental Station

ZUIHO - PALAU Government Vessel

ZUIHO - Government of Southern  
Islands

MISAGO - Government of CHOSEN

## ENCLOSURE (D)

PREFECTURAL FISHERIES EXPERIMENTAL STATIONS  
OCEANOGRAPHIC RECORDSMaterial Requested

On 9 January 1946 all Prefectural Fisheries Experimental Stations engaged in marine work were requested to submit reports on oceanographic projects undertaken since 1940. The request specified that the material

"...should include all published reports, copies of unpublished reports in manuscript form and, where studies have not terminated, progress reports on the status of the work to date. Appended to each report will be complete oceanographic data acquired in connection with the studies described therein. The observations to be covered are: currents (tidal and non-tidal), water temperature, salinity, density, chemical composition of the water, composition of the bottom, transparency, waves, sea ice, fouling organisms, and zooplankton. Each record will contain the exact geographical location, water depth and the date of the observation. Omit reports on fisheries studies in which no oceanographic observations were made.

"In addition to data obtained in connection with special studies, copies of all other records of routine oceanographic observations, such as daily water temperature and salinity data will be submitted. Describe the apparatus and methods used to obtain the data."

Material Obtained

(NavTechJap Document No. ND50-5109)

The following stations submitted data on oceanographic observations in coastal waters in response to the above request. These consisted of daily station records and oceanographic surveys in neighboring coastal waters. No publication or analyses of the data have been made.

Pref. Fisheries  
Exp. Station

Records in: English Japanese

MIYAGI	1	1
SAGA	1	1
SHIMANE	1	1
AICHI	1	1
YAMAGATA	1	1
TOYAMA	1	1
TOTTORI	1	1
TOKUSHIMA	1	1
IBARAGI	1	1
KAGAWA	1	1
IWATE	1	1
YAMAGUCHI	1	1

The following prefectural stations reported that no oceanographic observations had been made:

AOMORI  
AKITA  
FUKUSHIMA  
CHIBA  
KANAGAWA  
NIIGATA

ICHIKAWA  
FUKUI  
SHIZUOKA  
MIE  
KYOTO  
WAKAYAMA

KOCHI  
FUKUOKA  
KUMAMOTO  
OITA  
OKAYAMA



## ENCLOSURE (E)

## LIST OF ACQUIRED JAPANESE MANUSCRIPTS ON OCEANOGRAPHY

General Central Meteorological Observatory and Branch Marine  
Observatories Oceanographic Projects Completed Since 1940  
(NavTechJap Documents No. ND50-5084.1-.7, ND50-5085.1-.36, ND50-5086.1-.23)

1. The Currents in the Seas of ARIAKE & YASHIRO. Z. YASUI, 1940.
2. Estimation of the Absolute Velocity of Ocean Currents by Dynamical Calculation. K. HIDAKA, 1940.
3. On the Energy of the "Kuroshio". K. KOINUMA, 1940.
4. The Motionless Surface in a Density Current & the Inclination of Sea-Bottom. K. HIDAKA, 1940.
5. The High Water in the Sea of ARIAKE in August, 1914. R. FUJIWARA, 1941.
6. The Meteorological Tide at SAIGO, OKI. S. NISHIGE, 1940.
7. The Tsunami Wave in OSAKA Bay. T. HIRONO & K. SAKATA, 1941.
8. On the Swell of the Sea within a Typhoon. T. OTANI, 1941.
9. On the Abnormal Sea Level Experienced in OSAKA Bay. K. SAKATA, 1941.
10. Annual Variation in the Water Temperature & Specific Gravity along Pacific Coast. Z. YASUI & K. KOSAKA, 1941.
11. The Period of Sea-Waves. K. HIDAKA, 1941.
12. A Study of the Tidal Wave. Z. YASUI & Y. SAITO, 1941.
13. The Surface Slope & the Development of Currents caused by Wind in a Closed Sea. K. HIDAKA, 1941.
14. On Tidal Wave. K. HIDAKA, 1941.
15. The Effect of Tide on Wind. M. KITADA, 1942.
16. Short-Period Oscillation in Lake and Sea Water. H. ARAKAWA, 1942.
17. The Shape of Steel Wire in the Water. K. HIDAKA & K. SAKATA, 1942.
18. The Tidal Current in the Bay of FUKUOKA. Y. SAITO, 1942.
19. The Effect of Rainfall on the Specific Gravity of Coastal Sea Water. S. NISHIGE, 1942.
20. The Drifting of Vessels under Wind Pressure. Z. YASUI & M. SAKATA, 1942.
21. The Lag of the Inverted Thermometer after its Inversion in the Light of Actual Oceanic Observation. Z. YASUI & Y. MORITA, 1942.
22. Barometric Changes due to the Tide. T. MIAKE & Y. MORITA, 1942.
23. The Simplicity of the Period of Sea-Waves. K. HIDAKA, 1943.
24. On the Choice of the Line for Freight & Passenger Ships between Japan proper & Formosa, in View of Weather and Sea Conditions. Z. YASUI & T. SEGI, 1943.
25. On the Currents in the South of the OKHOTSK Sea. T. MAENAKA, T. NAKAYAMA & I. TAKAHASHI, 1943.
26. On the Seiche in Sotoura. T. SEGI, 1943.
27. The Stationary Current in Lake & Sea Due to Wind in the Deformation of Elastic Plate. K. HIDAKA.
28. Earth's Rotation and Currents in a Closed Sea. K. HIDAKA, 1943.
29. On the Diminution of the Floating Mass of Ice. M. UDA, 1943.
30. The Surf along the Coast of FUSHIKI. T. TAGUCHI, 1943.
31. Some Notes on the Accuracy of Oceanic Observation. M. UDA, 1943.
32. A Method of Determining Wave-Length & Wave-Height with Ordinary Photographic Print. T. SEGI, 1944.
33. Drift Current in a Rotating Rectangular Sea of Uniform Depth. M. MIYAZAKI, 1944.
34. The Currents in the Inland Sea of SETO & the Art of Steering of Vessel. Z. YASUI, 1944.
35. The Relation between Wave & Wind & Current in the AKASHI Strait & the Limit of Safe Navigation for Small-Sized Vessels. Z. YASUI & T. SEGI, 1944.
36. The Possibility and its Limit of the Formation of Bubbles in Sea-Water. T. MIYAKE, 1944.
37. Variation in the Temperature of the Water of the Lowest Layer in a Deep Lake of Temperate Zone in Winter & Spring. S. YOSHIMURA, 1944.

## ENCLOSURE (E), continued

38. The Effect of Earth's Rotation on the Drift Current in a Closed Sea. K. HIDAKA, 1944.
39. A Study on Sea-Waves. K. HIDAKA, 1944 (2 parts).
40. Evaporation from the Surface of the Sea. Y. SAITO, 1945.
41. Vertical Stability of Sea Water. Y. SAITO, 1945.
42. Stable Oscillation of the Ocean. Y. SAITO, 1945.
43. The Pressure-Proof Inverted Thermometer for use in Shallow Seas. K. HIDAKA & others, 1945.
44. Observations of Foam Produced by Aquatic Plants. Y. MATSUDAIRA & M. MORI, 1945.
45. Graphical Solution of Eddy Diffusion and Heat Conduction. Y. TAKAHASHI, 1941.
46. One Mathematical Solution of Wave Equation. Y. TAKAHASHI's Method. S. HONMA, 1941.
47. On the Numerical Calculation of Eddy Flux. Y. TAKAHASHI, 1941.
48. An Introduction to the Statistical Theory of Eddy Diffusion. Y. TAKAHASHI, 1943.
49. An Example of the Statistical Treatment of Eddy Diffusion in Dimensions. Y. TAKAHASHI.
50. Inquiries into Sea-Ice (SAPPORO and HAKODATE), 1945.
51. Survey of the HUNKAWAN (HAKODATE), 1945.
52. Oceanographic Observations in Seas Surrounding HOKKAIDO (HAKODATE), 1945.
53. Oceanographic Observations in the TUGARU and SOYA Channels (HAKODATE) (2 parts), 1945.
54. The Study of Coastal Waves (KOBE, TOKYO). WATANABE & YOSHIDA, 1945.
55. Study of Bubbles of Sea Water (KOBE, TOKYO) (incorporated in No. 39). Y. MIYAKE, 1945.
56. Studies on fouling Organisms and the Methods of Prevention. MATSUDAIRA, I. NAKAYAMA, H. YASUDA.

Manuscripts Supplied by the Institute of Physical and Chemical Research  
(NavTechJap Documents No. ND50-5110.1-.4)

57. Biological and Chemical Studies on Fouling of Ship Bottoms and Anti-Fouling Paints. K. FUKAGAWA, E. OYAMA, and S. ISHIDA. FUKAGAWA Laboratory, TOKYO.
58. Investigations on Sea-Waves. T. SHIMIZU. Shimizu Laboratory, TOKYO (manuscript and reprint).
59. Magnesium Chloride in Sea Water. K. INABA. Inaba Laboratory, TOKYO (manuscript and reprint).
60. On Sea Water. Isobe Laboratory, TOKYO.

Miscellaneous Manuscripts  
(NavTechJap Document No. ND50-5112)

61. Boring Animals Detrimental to Wooden Ships. S. MURAKAMI. Amakusa Laboratory. Kyushu Imperial University (manuscript in Japanese with English summary).

## ENCLOSURE (F)

## LIST OF ACQUIRED JAPANESE DOCUMENTS AND DATA

(Accessions arranged and numbered in order of receipt)

NavTechJap No.	Seized (1946)	Institution	Publication	Quantity in Lot
ND50-5051	1-15	Imp. Fish. Exp. Sta.	Semi-ann. Rept. Oceanographic Invest. (#66-71)	6 sets (6 nos. per set), Jan. 1941-Oct. 1943.
52	1-15	Imp. Fish. Exp. Sta.	Journ. of Imp. Fish. Exp. Sta., Mar., 1940-Mar. 1943	6 sets (4 nos. per set) Nos. 10-13.
53	1-15	Imp. Fish. Exp. Sta.	Fishery Invest. Supp. Rept., Mar. 1940-Mar. 1943.	6 sets (3 nos. per set) Nos. 7-9.
54	1-15	Imp. Fish. Exp. Sta.	Mo. Oceanographic Charts, Jan. 1941-Feb. 1944.	1 comp. set. 38 charts. 2 sets with 1 May '43 lacking.
55.1- to .12	1-17	Imp. Fish. Inst.	Bull. Jap. Soc. of Sc. Fish. (1932-43).	5 sets (12 vols per set, 72 nos.
56	1-17	Imp. Fish. Inst.	Journ. of Imp. Fish. Inst. (1940-1942)	5 sets. (3 nos. per set).
57.1	1-17	Imp. Fish. Inst.	Annot. of Oceanog. Res. (1926-29)	1 set (4 vols).
57.2	1-17	Imp. Fish. Inst.	Misc. Reprints by Dr. H. Niino.	27 copies.
58	1-17	Imp. Fish. Inst.	Quart. Repts. of Oceanog. Invest. (1924-29)	23 Nos. (Nos 21-43).
59.1- and .2	1-22	Tokyo Imp. Univ. (Faculty of Ag.)	Proc. Scient. Fish. Assoc. 1940-41, 1944.	5 sets (Vol. 8, Nos 1-4; Vol. 9, Nos 2-4).
60.1- to .3	1-25	East Asia Res. Inst.	"Oceanographic Invest. in the W. Pac."	2 ccs. Vol I, Pts. I&II, 1cc Vol. I Pt III, 1942.
61.1- to .7	1-29	Kobe Imp. Mar. Obs.	Journ. of Oceanography - Kobe	1 cc each, Vol. II (No. 3), Vol. 12 (Nos 1, 2, 3), Vol. 13 (Nos 1, 2, 3).
62	1-29	Kobe Imp. Mar. Obs.	Tidal Currents of Osaka Wan, 1932, and encl.	1 bound copy, 1 pamphlet (enclosed)
63	1-29	Kobe Imp. Mar. Obs.	Mem. Imp. Mar. Obs.	Vol. VII, No. 3, Feb. 1941.
64.1- to .29	1-8	Hyd. Office Imp. Navy	Orig. Corrected Records of Nav. Ocean. Surveys.	29 bundles (188 books, 31, 147 stations).

## ENCLOSURE (F), continued

NavTechJap No.	Seized (1946)	Institution	Publication	(quantity in Lot)
ND50-5065	1-21	Hyd. Office Imp. Navy.	Suiro Zasso, Micro-film of 1 comp. set.	Vol. I-VII (comb.) Vols 8,9,10 sepa- rates.
66.1- to .4	1-30	Kyoto Imp. Univ.	Mem. Coll. of Science	Series A, Vol. 23, Nos. 1,2,3 (1940); Series B, Vol. XV, No. 3, Art. 9, (1940).
67.1	1-30	Kyoto Imp. Univ.	Reprint, "Tides and Seiches Seiches of Osaka Bay," Y. Toyohara.	Reprint. Mem. Coll. Science, Vol. 15, No. 3, 1932.
67.2	1-30	Kyoto Imp. Univ.	Otsu Limno. Lab. #35 Anti- Borer Treatment.	Reprint, Otsu Lab. No. 35, Aug. 1945.
67.3 and .4	1-30	Kyoto Imp. Univ., Otsu Lab.	Limno. Reprints desig- nated for Narr. Lab.	36 Biological Re- prints (misc.).
68	1-30	Kyoto Imp. Univ., Otsu Lab.	15 misc. papers of Physico-Chem. Soc.	Papers by S. Horiba, (Anti-fouling paint, etc.)
69	1-30	Kyoto Imp. Univ., Otsu Lab.	Papers on Oceanog. (sedi- ment.) by T. Nomitsu	Bound vol. of 13 papers, all since 1940.
70.1	2-1	Kyushu Imp. Univ.	Reprint. Sonic Fishes of Japan, K. Uchida.	Reprint. Jap. Soc. of Science, Vol. 9, 1934.
70.2- to .4	2-1	Kyushu Imp. Univ.	Studies on Turbulence, (3 parts) M. Kurihara	Inst. Fluid Engi- neering, 1942-1943.
70.5- to .11	2-1	Kyushu Imp. Univ.	Reprints on Mar. Invert., Aikawa & Murakami.	7 misc. biological reprints.
70.12	2-1	Dist. Met. Obs., Fukuoka	Oceanog. Sc., by K. Suda.	1 bound volume, 1943 (revised ed.)
71	2-5	East Asia Res. Inst.	Oceanog. Invest. in W. Pac.	3 sets, 3 parts in each set.
72.1- to .10	1-22	Tokyo Imp. Univ.	1 Bull. Earthquake Inst; 1 Journ. Zool.; 4 Zool. Soc. Japan; 2 Zool. Mag.; 2 Journ. Coll. Ag.	10 misc. marine biol. and oceanog. reprints.
73.1- to .10	1-21	Hyd. Office Imp. Navy.	9 Secret Ocean. Pub. (Gen. Info. Series), 1 Tides So. China Sea.	10 misc. doc., dup- licates of Target X-18.
74.1- to .23	2-2	Govt. Fish. Exp. Sta., Fusan.	16 ann. Ocean. Repts. & 7 ann. Hyd. Repts. (From Dr. Uchida).	
75	2-7	Cent. Met. Obs.	The Geophysical Mag.	5 ccs, Vol. XIII, No. 3-4, 1940.

## ENCLOSURE (F), continued

NavTechJap No.	Seized (1946)	Institution	Publication	Quantity in Lst
ND50-5076.1- to .3	2-9	Tohoku Imp. Univ.	Sc. Repts of the Tohoku Imp. Univ. (Fourth Series).	5 sets, Vol.XV-XVII, 1940-43(4 nos. in vol).
77.1- and .2	2-9	Tohoku Imp. Univ.	Studies, Inst. Geol. and Paleont.	5 ccs each, 2 papers on bottom sed.
78.1- to .3	2-9	Tohoku Imp. Univ.	Repts. of the Inst. of Agr. Res. (Fishery Series).	7 ccs each, No. 1 (1942 No. 2 & 3, 1943).
79	2-9	Tohoku Imp. Univ.	Misc. Reprints.	16 reprints.
80	2-11	Central Met. Obs.	Journ. of the Oceanograph- ical Soc. of Japan.	5 comp. sets, Vol.I, (Nos. 1,2), Vol.II (Nos. 1-4), Vol.III (No.1).
81.1- to .4	2-11	Central Met. Obs.	Science of the Ocean, Ocean. Soc. of Japan.	6 incomp. sets, Vol. 1-IV(see CMO folder)
82	2-18	Imp. Mar. Obs., Kobe	Mem. of the Imp. Mar. Obs. Kobe.	3 sets, Vol.VII, Nos. 3&4, Feb-Mar.1941.
83.1- and .2	2-18	Imp. Mar. Obs., Kobe	Journ. of Oceanog.	Vol.12, No.1(4ccs) Vol. 12, Nos. 2&3, Vol 13, Nos.1-3(3ccs), Vol.13, No.4 & Vol. 14, No.1-2, (1cc).
84.1- to .7	2-18	Cent. Met. Obs.	Oceanog. Data, manuscripts	(See list Encl.D) 7 parts.
85.1- .26	2-18	Cent. Met. Obs.	Manuscript reports on Oceanog. studies, 1940- 1943.	26 papers (See list Encl.D).
86.1- to .23	2-18	Cent. Met. Obs.	Manuscript reports on Oceanog. studies, 1941- 1945.	23 papers (See list Encl.D).
87.1- and .2	2-18	Cent. Met. Obs.	25 Misc. Reprints, Hidaka, Science of Ocean. Vol. 4, No. 4.	
88.1- and .2	2-19	Natl. Research Council	Records of Oceanog. Works of Japan	5 sets, Vol.I-II, 3 extra ccs of Vol.1, No.3, Vol.II, No.1.
89.1- to .3	2-19	Natl. Research Council	Records of Oceanog. Works of Japan	5 sets, Vol.III-V, 1 extra cc Vol.V No. 1&2.
90.1- to .3	2-19	Natl. Research Council	Records of Oceanog. Works of Japan	6 ccs Vol.VI, No.1,2; Vol.VII, No.1, Vol. VIII No.1, 1 cc Vol. VII, No.2, Vol.VIII No.2.

## ENCLOSURE (F), continued

NavTechJap No.	Seized (1945)	Institution	Publication	Quantity in Lot
ND50-5091.1- to .4	2-19	Natl. Research Council	Records of Oceanog. Works of Japan	6 ccs Vol. IX, No. 1, 2, Vol. X, No. 2, Vol. XI, No 2; 1 cc Vol. X, No. 1, Vol. XI, No. 1, Vol. XII, No. 1.
92	2-21	Govt. Fishery Exp. Sta., Chosen.	Bulletin	2 sets (each of 8 vol) No. 1 (1925)-No. 8 (1943) incl.
93.1- to .5	2-21	Govt. Fishery Exp. Sta., Chosen.	2 sets Ocean. Charts, 1928-1941 incl)	1 extra cc yrs 1941- 2; 2 ccs each Ocean. Invest. No. 1 & 2; 2 ccs Ocean. Charts for 1927 (supplement).
94	2-21	Govt. Fishery Exp. Sta., Chosen.	2 sets Ann. Rept. of Hyd. Invest. for yrs 1926-34, Nos. 1-9, (1928-1942).	
95	2-21	Govt. Fishery Exp. Sta., Chosen.	69 miscellaneous special papers.	
96	2-25	Hokkaido Imp. Univ.	Sc. Papers of the Inst. of Alg. Res.	5 ccs Vol. 2, #2, (1941), Vol. 3, #1, (1944).
97	2-25	Hokkaido Imp. Univ.	Journ. of the Fac. of Sci., Series V.	5 ccs Vol 4, #5, (1941), Vol. 5, #2, (1942), #3 (1944).
98.1- to .3	2-25	Hokkaido Imp. Univ.	Journ. of the Fac. of Sci., Series VI.	5 ccs Vol 7 (3 nos) Vol. 8 (4 nos.), Vol. 9 (No. 1).
99	2-25	Hokkaido Imp. Univ.	114 misc. reprints by various authors, includ- ing duplicates.	
5100	2-25	Hokkaido Imp. Univ.	146 misc. reprints by various authors, includ- ing duplicates.	
01	3-4	Natl. Research Council	Plankton Periodical	5 sets, Vols. 2-15 (incl).
02.1- to .10	3-4	Natl. Research Council	Jap. Journ. of Zool.	5 sets, Vols 1-8, except Vol. 6, No. 1 & 3, and Vol 8, No. 1 & 2.
03.1- to .10	3-4	Natl. Research Council	Jap. Journ. of Ast. and Geophysics.	5 sets, Vol 1-21.
04.1*	3-4	Imp. Fish. Inst.	Journ. of Fisheries, 1 in- comp. set.	Vol. 24-39, 77 nos.
04.2*	3-4	Imp. Fish. Inst.	Journ. of Fisheries, 1 in- comp. set.	Vol. 18-23, 52 nos.

## ENCLOSURE (F), continued

NavTechJap No.	Seized (1946)	Institution	Publication	Quantity of Lot
N950-5105*	3-4	Imp. Fish. Inst.	Journ. of Assoc. of Fish. Hob., 1 incomplete set.	Vol. 28-39, 78 nos.
06(a)	3-4	Cent. Met. Obs.	Science of the Sea	Vol. 13.
06(b)	3-8	Jap. Hyd. Dept.	1 cc each, Hyd. Bull., Vol. 24, No. 1, Vol. 21 suppl., No. 602, and misc. studies, 1942.	
06(b)	3-8	Imp. Fish. Inst.	Journ. of Fisheries, 1 incomplete set.	Vol. 32-34, 25 nos.
06(b)	3-8	Imp. Fish. Inst.	Reprints in Japanese.	14
07	3-8	Jap. Soc. for Promotion of Scientific Research.	Palau Trop. Biol. Sta. Studies.	1 each, No. 2, 1937, and No. 4, 1939.
08.1	3-8	Tokyo Univ. of Lit. and Science.	Biol. Rept. of the Shimoda Lab.	5 ccs, No. 1, 1935.
08.2*	3-8	Tokyo Univ. of Lit. and Science.	Science Reports.	5 ccs of incomplete sets (12 nos., 1933-1945) 55 in all.
09	3-8	12 Prefectural Fisheries Stations.	Records of Oceanog. Observations.	12 manuscripts.
10.1- to .4	3-8	Inst. of Phys. and Chem. Research.	Manuscripts on Oceanog.	4 ccs with accompanying publication.
11	3-8	Kominato Laboratory	Manuscript data - Meteorology, Oceanography.	Daily records, 1940-Jan. 31, 1946.
12	3-8	Amakusa Laboratory, Kyushu Imperial University.	Manuscript in Japanese with English summary.	1 copy.

\*Itemized list of numbers has been prepared for Hydrographic Office.

## ENCLOSURE (G)

## LIST OF ACQUIRED JAPANESE OCEANOGRAPHIC MATERIALS AND APPARATUS

<u>NavTech</u>	<u>Jap No.</u>	<u>Institution</u>	<u>Item</u>	<u>Quantity</u>
JE50-5051		Tokyo Imp. Univ. College of Agriculture.	1 case animal sound recordings, (Nos. 1-25).	13 discs in 1 case.
	52	Hydrographic Department, Tokyo	Jap. (Knudsen type) pipette (glass)	1
	53		Jap. burette (Knudsen type) (glass)	1
	54		Jap. burette (glass)	1
	55		Reversing thermometer (protected)	1
	56		Reversing thermometer (unprotected)	1
	57		Nansen type water bottle	1
	58		Ekman type water bottle	1
	59		Ekman type current meter	1
	60		Surface water sampler	1
	61		Meter wheel	1
	62		Clinometer	1
	63		Seawater color comparitor	1 set
	64		Seawater color comparitor frame	1
	65		1 tube 'normal sea water'	1
	66		Chemical water sample bottles	2
	67		Salinity sample bottles	3
	68		Transparency disc, (Secchi Type)	1
	69	General Central Meteorological Observatory.	Manuscript chart on tracing cloth by Y. Takenouchi	1



## ENCLOSURE (H)

COMMUNICATION INTERFERENCES IN THE SEA - PHYSICAL FACTORS  
BY DR. KOJI HIDAKA

(In charge of research, General Central Meteorological Observatory, and Professor, Faculty of Science, Tokyo Imperial University)

Acoustic apparatus for submarine detection was under investigation by the Naval Technical Institute when in August 1943 a branch station was established on ENOURA Bay near NUMAZU for the special purpose of improving acoustic apparatus. The station was quickly placed in operation and in early autumn I. NAMBA reported to Dr. S. FUJIWARA, Director of the General Central Meteorological Observatory, that in the hydrophones placed in the sea adjacent to ENOURA, strange noises, disturbing the function of the hydrophones, occurred every night at certain definite hours. He then asked the Director to determine the sources of these noises by hydrographical researches in this sea. For this purpose an oceanographical survey of this bay was carried out in December 1943 by members of the General Central Meteorological Observatory on board the R. S. Asasio Maru. The true nature of the noises was not found out easily. S. MIYAKE and Y. TAKENOUCHI took leadership in this expedition. On December 27, 1943, a conference of specialists in this field was called at the Naval Technical Institute, MEGURO, Tokyo. Prominent guests were Drs. H. NAGAOKA, H. YAGI, S. FUJIWARA, T. NOMITSU, K. HAYASHI, K. HIDAKA, Y. MIYAKE and Y. TAKENOUCHI. The chief hosts were Vice Admiral Viscount Dr. T. TOKUGAWA, Director Rear Admiral T. MIYAZAWA, and Capt. T. KUYAMA. Besides these there were present some authorities from naval operations. We were told that the audibility of acoustic apparatus fluctuates considerably according to the hydrographic conditions of the sea, the reasons being quite unknown. Hereby we were appointed to make clear the mechanism of this variation of audibility and to search for the relation between the audibility and the hydrographic conditions. The demand of the Navy involved very difficult problems. First we had no definite idea about the propagation of acoustic waves in sea-water. Secondly it was very difficult to grasp a correct concept of the mechanism of these fluctuations. The naval specialists stated that there are regions of bad audibility in the sea just like clouds are floating in the sky. Dr. FUJIWARA said that it may be air bubbles contained in the uppermost layers of the sea that scatter the sonic waves, while MIYAKE insisted that bubbles will be almost absent, due to water pressure, in the subsurface layers under question. But the general opinion prevailed that it might be the turbulence in the water which disturbs that propagation of sonic waves. For these reasons it was thought very difficult to decipher this riddle of the sound by ordinary hydrographic observations of the type hitherto carried out. Therefore a special apparatus for measuring the dissipation of sonic energy was supplied by the navy. This consisted of a rod to which a hydrophone and transmitter were attached in a straight line and the rate of dissipation by water could be determined by observing the intensity of sonic waves at two different distances between the transmitter and hydrophone. The frequency used was 100 KC, which seemed to me rather high though it was said to be an inevitable consequence for making the waves concentrate in one direction. The apparatus was used in a bifilar suspension from the ship and the observations were made from the surface to 15 meters at one meter intervals.

The survey was again made in May 1944 by the members of the General Central Meteorological Observatory on board R.S. Asasio Maru. Of course ordinary hydrographic observations were carried out simultaneously. Y. MATSUDAIRA and Y. SAITO, of the Kobe Marine Observatory, also carried out the same experiment in the BUNGO SUIDO on board R.S. SHUMPU MARU. But since this queer phenomenon is microoceanographic, it was very difficult to make clear the mechanism by usual oceanographic survey alone. In the end the general opinion was that the propagation of sound seems to be hindered by the presence of microscopic turbulence in the movements of the sea water. But it could be also said that the

## ENCLOSURE (H), continued

microscopic turbulence which seemed very conspicuous in this bay might not be so striking in the open sea where the fluctuations of hydrographic conditions are by far less intense. We were told indeed by the naval authorities that the reason why ENOURA Bay was chosen for the experimental ground is its morphological condition; the depth is very uniform in this bay. But from the hydrographic point of view this bay can not be said to be very well fitted for this purpose, because there are several different masses of water, that is, the coastal water, KUROSHIO water and the river water from the land. These systems of water necessarily forms eddies along the boundary surfaces and microscopic turbulence occurs there.

But the most effective factors in the open sea disturbing the audibility must, in my opinion, be the reflection of sound rays along the boundary surfaces between different water masses and the refraction of the sound rays when the density of the sea water gradually changes vertically or horizontally. This view was firmly held by S. KUWABARA (Hydrographic Department), Y. TAKENOUCHI and K. HIDAKA. This effect is found most intense in the uppermost layers of the sea where the vertical gradient of density was chosen and it was concluded that the more intense this gradient, the worse is the audibility. The disturbance due to the reflection can be expected along the discontinuities between different water masses, that is, the polar front, the boundaries between the KUROSHIO and the coastal waters, and the subtropic convergences.

To test these effects joint experiments were carried out in Lakes KAWAGUCHI and HAKONE several times by the Central Meteorological Observatory and the Naval Technical Institute. When there is discontinuity there it is due to temperature stratification in the upper layers since there is no salt in lakes, and other disturbing factors were thought to be less active. The results of the experiments were not negative.

Taking these circumstances into account, KUWABARA and TAKENOUCHI drew at the beginning of 1945 synoptic charts showing the variation of audibility in different parts of the seas adjacent to Japan. KUWABARA in his first chart published by the Hydrographic Department considered the effect of refraction due to the vertical variation of density in the uppermost layers only, while TAKENOUCHI'S bimonthly maps were drawn taking the effects of reflection, refraction, and turbulent eddies into account. These maps were however not prepared before the summer of 1945. Of course, these charts were scarcely made use of before the war ended on August 15, 1945.

## ENCLOSURE (I)

ABSTRACTED REPORT ON SOUNDS PRODUCED BY AQUATIC ANIMALS  
WITH INDEX TO ACQUIRED DISK RECORDINGS  
BY DR. YOSHIO HIYAMAFisheries Institute, Faculty of Agriculture  
Tokyo Imperial UniversityOrdered by: Japanese Research Council, included in Committee of Disturbance  
of Submarine Communication, Chairman Koichi ITO.Locality of Experiment: Marine Biological Station, MISAKI.Date: 1943 to 1944.Materials: Coastal aquatic animals caught near MISAKI.List of Scientific Names:Fish

Ophichthys sp.  
Scomber japonicus  
Trachurus japonicus  
Parapristipoma trilineatum  
Plectorhynchus cinctus  
Oplegnathus fasciatus  
Lateolabrax japonicus  
Epinephelus septemfasciatus  
Epinephelus moara  
Halichoeres poecilopterus  
Xesurus scapulum  
Monacanthus tomentosus  
Rudarius ercodes  
Spheroides niphobles  
Spheroides pardalis  
Canthigaster rivulatus  
Pterois lunata  
Chelidonichthys kumu  
Cyprinus carpio (fresh water)

Mollusca

Cuttle fish	Sepia sp., Sepioteuthis lessoniana
Squids	Loligo sp.
Clams	Meretrix meretrix*

Crustacea

Spiny lobster	Panulirus burgerii
Hermit crab	Aniculus aniculus
Shrimp	Alpheus sp.*

Mammalia

Dolphins	Dolphinus sp.*
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\*Not recorded.

## ENCLOSURE (I), continued

Instrument Used: Carbon microphone was dipped into solution of rubber so as to be wrapped by thin film of rubber to be water tight. Amplifier is 6W power, having KX-80, UZ-6C6, UZ-6C6, and UZ-6L6A.

Physical Considerations of Sound: No wave analyses were tried yet. Almost all of them bear all wave quality including supersonic sound, that resembles the shock of solid matter, such as stones.

Biological Considerations: I tried to classify by ecological meanings of making sounds. The result is as follows:

1. Sound produced by eating foods. Example: File fish.
2. Sound produced in spawning time. Example: Croaker.
3. Sound of swimming. Example: Cuttle fish.
4. Sound of breathing. Example: Dolphin.
5. Sound of warning. Example: Gurnard.
6. Sound produced when captured by net. Example: Globe fish.

By this classification the season of occurrence, duration, rhythm, influence of other sounds, and the qualities of the sound can be easily understood.

Sound Disc Records:

Method of Recording: Fish are cultured in tanks in the aquarium until they take food and become acclimated. Sometimes floating cages are used to keep the fish alive. Several times microphones were set in the open sea, but could not endure the strength of coastal waves due to weak construction. Sounds were recorded on acetate discs.

Mechanisms of Making Sound: Different in almost all kinds of fish. When eating the food the sounds are produced by the shock of teeth, foods, and pharyngials. When swimming the friction between body and water is mostly the cause. It also is the same in breathing and when captured. Spawning and warning sounds are mostly by air-bladder. The lobster and shrimp are quite different, the former rub the bases of the second antennae, and in the latter it is the shock of chelae.

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## LIST OF RECORDS SUPPLIED TO NAVAL TECHNICAL MISSION TO JAPAN

<u>No.</u>	<u>Scientific Name (Vernacular Name)</u>	<u>Conditions</u>
1	Monacanthus ciliifer (File fish)	feeding Mysis sp.
2	Epinephelus septemfasciatus (Rock fish)	feeding
3	Ibid	ibid
4	Aniculus aniculus (Hermit crab)	feeding
5	Parapristipoma trilineatum	feeding
	posterior half Spheroides pardalis	
	(Globe fish)	ibid
6	Speroides pardalis	ibid
	posterior half S. niphobles	ibid
7	1st and last S. niphobles	captured by net
	2nd and 4th Monacanthus ciliifer	ibid
8	Ophichthys sp. (Eel-like fish)	captured
	2nd and last are test by human voice	
9	S. niphobles. last Monacanthus ciliifer	captured
10	Monacanthus ciliifer	captured
11	1st Ophichthys, 2nd Monacanthus,	
	3rd and 4th are Spheroides niphobles	captured
12	1st Ophichthys, 2nd Monacanthus,	
	last S. niphobles	ibid

## ENCLOSURE (I), continued

<u>No.</u>	<u>Scientific Name (Vernacular Name)</u>	<u>Conditions</u>
13	Sepioteuthis lessoniana (Cuttle fish)	Swimming
14	1st Sepioteuthis 2nd Monacanthus 3rd Canthigaster rivulatus (Globe fish) last Canthigaster rivulatus (Globe fish)	captured
15	1st and 4th Canthigaster, 2nd and 5th S. niphobles, 3rd Monacanthus	captured
16	Anterior Xesurus scapulum posterior Monacanthus cilifer	feeding
17	Monacanthus cilifer	1st swimming then feed 2nd swimming 3rd feeding
18	1st Monacanthus cilifer 2nd S. pardalis last ibid	feeding feeding swimming
19	1st and 2nd S. pardalis last Halichoeles poecilopterus	feeding feeding
20	1st and 2nd Pterois lunulata last is test by human voice	feeding
21	1st, 2nd, and 3rd are ibid 4th and 5th Epinephelus septemfasciatus	feeding
22	Aniculus aniculus (Hermit crab) 2nd and 3rd Sepia sp. (Cuttle fish)	feeding swimming
23	All five Sepioteuthis lessonians	swimming
24	The young of ibid	captured
25	Aniculus aniculus (Hermit crab)	feeding
26	Parapristipoma trilineatum	feeding
27	Ibid	captured
28	Therapon theraps	failed
29	Epinephelus moara (Rock fish)	feeding
30	1st Panulirus burgeri (Spiny lobster) 2nd and 3rd Sepia sp (Cuttle fish)	captured 2nd swimming 3rd captured
31	Various fishes in floating net	swimming
32	Ibid	
33	Monacanthus cilifer (File fish)	feeding
34	Spheroides pardalis (Globe fish)	feeding
35	1st Epinephelus moara 2nd ibid, microphone in the air 3rd Plectorhynchus cinctus 4th Oplegnathus fasciatus	feeding ibid ibid ibid
36	Epinephelus septem fasciatus 1st and 2nd microphone in the water 3rd and 4th in the air	feeding
37	Ibid. 1st and 2nd in the air, 3rd to 5th in the water, last Lateolabrax japonicus	feeding
38	1st to 3rd Lateolabrax 4th to 6th Pterois lunulata	ibid feeding ibid
39	Trachurus japonicus	feeding on Mysis
40	Anterior Monacanthus cilifer posterior Parapristipoma trilineatum	capturing feeding
41	Panulirus burgeri (Spiny lobster)	warning
42	Ibid	ibid
43	Cyprinus carpio (Carp)	feeding
44	Ibid	ibid
45	Ibid, anterior microphone beneath water posterior in the air	ibid
46	Ibid, microphone in the air	ibid
47	Ibid, the bait on the bottom	ibid
48	Test	
49	Contrast, Crickets in the field	

## ENCLOSURE (I), continued

<u>No.</u>	<u>Scientific Name (Vernacular Name)</u>	<u>Conditions</u>
50	Ibid	
51	Ibid	
52	Ibid	
53	Ibid	
54	Unrecorded	
55 to 83	are edited from 1 to 42	
55	Monacanthus cilifer (File fish)	feeding
56	Ibid	ibid
57	Spheroides pardalis (Globe fish)	ibid
58	Ibid	ibid
59	Epinephelus septem fasciatus (Rock fish)	ibid
60	Epinephelus moara (Rock fish)	ibid
61	Lateolabrax japonicus	ibid
62	Unrecorded	
63	Plectorhynchus cinctus and Oplegnathus fasciatus	ibid
64	Unrecorded	
65	Parapristipoma trilineatum	ibid
66	Ibid	ibid
67	Trachurus japonicus	ibid
68	Unrecorded	
69	Aniculus aniculus (Hermit crab)	ibid
70	Unrecorded	
71	Loligo sp (Squid)	swimming
72	The young of cuttle fish	ibid
73	Ibid	
74	Test	
75	Panulirus burgeri (Spiny lobster)	warning
77	Ibid	
78	Ibid	
79	Sepioteuthis lessoniana (Cuttle fish)	Captured
80	The young of the cuttle fish	ibid
81	Canthigaster rivulatus (Globe fish) and Spheroides niphobles (Globe fish)	ibid
82	Monacanthus cirifer (File fish) and Ophichthys sp. (Eel-like fish)	ibid
83	Monacanthus cilifer	ibid
84	Unrecorded	

Note

Locality: MISAKI Marine Biological Station, KANAGAWA Pref.

Date: During the summer of 1944.

Almost all the fish were cultured in an aquarium so as to take foods. The microphone, carbon water proof, was set on the bottom of aquarium. 6W amplifier was used. Recorded on discs. These sets are different from those used by the Japanese Navy and were specially made for this purpose.

There are many kinds of sound producing aquatic animals near Japan. But for all the kinds, recording could not be done, because the microphone could not be used in the open sea; it was too weak to endure the strength of the waves.