Report by Dr. John C. [redacted]
Director, Division of [redacted] logy and Medicine
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EFFECTS OF PACIFIC TEST OF OPERATIONAL TUNA FISH

The purpose of this memorandum is to review the recent events in the Pacific related to the problems of the marketing of tuna fish, and a statement of our current activities with respect to this subject.

While the Commission has for seven years conducted research on the effects of the Hanford operations on the salmon of the Columbia River and has sponsored recurring surveys of the effects of nuclear detonations on the marine biological balance of both Bikini and Eniwetok atolls, it appeared that, with the impending tests of large yield weapons in the Pacific when the thermonuclear program was advanced sufficiently to indicate that such weapons were possible, an expansion of our knowledge of marine biology was needed. Since the food supplies of large populations, both in Asia and North America as well as the islands of the Pacific, are derived from the sea, any significant radiological contamination of any portion of these food chains would be of serious concern to us.

Therefore, prior to Operation [redacted] I initiated an expansion in the amount of marine biological studies which would be conducted prior to the test as well as after the conclusion of operations. A plan for the establishment of a Marine Biological Station on Eniwetok was presented to the Advisory Committee for Biology and Medicine and was recommended by them on March 14, 1953. Construction of this small laboratory was begun after the completion of Operation IVY and is now in existence and being actively utilized for the marine work during the current test series. The purpose of this station is to permit marine biologists from universities, after proper clearance, to make use of the facilities at Eniwetok for the conduct of marine studies of all kinds that are especially pertinent to the biological pattern of the atoll. This should add substantially to the general knowledge of the fauna of this area, and in particular should give us quantitative information which will be invaluable in years to come.

At the same time, a general increase in emphasis on marine studies was begun with specific reference to the uptake of fission products by plankton, shellfish, and other portions of the human food supply from the sea. This has been conducted at various marine research centers such as Woods Hole, the University of Washington at Seattle, the University of Hawaii, and the University of North Carolina. Steps have been taken with the Smithsonian Institution to conduct certain related studies in both fresh and salt water marine problems at the only tropical biological station possessed by the United States - that at Barro Colorado Island in the Canal Zone.

Tuna Fishing [redacted]

Before the initiation of the CASTLE series, and especially in connection with any deep underwater test that might be considered, it seemed to us that the impact of such operations on tuna fishing would be a serious one. Consequently, some months back I assigned this problem as a major concern to Dr. Willis R. Boss of the Biology Branch of this Division. Dr. Boss visited Eniwetok, accelerated the construction and equipment of the laboratory there, conferred with fisheries research people in Honolulu, augmented the level of our support there, and reviewed with various Navy and fisheries groups on the West Coast the problems of tuna fishing and marketing in general.

The tuna is a fish that ranges widely in tropical and temperate waters of the Pacific Ocean and is an important economic asset especially to Japan and the United States, including the Territory of Hawaii. Six species are recognized, and there are some differences between those of the western waters and those of the eastern Pacific. Tagging experiments have shown, however, that individual fish may travel great distances over a period of a few weeks. Tuna tagged off California have been caught as far away as the waters of Japan. The catch coming into the United States is in part from American fishermen operating mostly in eastern waters of the Pacific, and from Japanese sources shipped from Japan either as frozen fish* or in cans.** Fisheries based in Hawaii are in general inadequate to meet the local demand both for immediate consumption and for packing for shipment to the United States, and a considerable amount of fish from Japanese sources is delivered to the Islands. Figures on the tuna catch for the years 1939 and 1951, by area and country, are shown in the attached table.

The region of the Marshall Islands is not very productive of tuna fish, and only Japanese fishermen bother to visit these waters. Prior to World War II there was no fishing of any consequence by the Japanese, although they themselves held these islands. Generally, fishing along the northern Marshalls is engaged in by ships going to or from the more productive areas to the south.

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* Frozen Tuna (1952)

Japan exported to U.S.A.[1]	45,300,000	pounds of frozen tuna
Japan exported to Canada	5,736,000	pounds of frozen tuna
Total	51,036,000	pounds of frozen tuna

[1] We import 69 million pounds (1952)

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Tuna Fishing [redacted]

The Japanese fishing ship, the Fukuryu Maru - the inappropriately named "Fortunate Dragon" - had a few tons of fish in the well at the time of the first detonation of the CASTLE series. The ship, according to her Japanese master, was at latitude 11° 53' North and longitude 166° 50' East, about 80 miles from the detonation. The gross fallout - which was chiefly partially hydrated calcium oxide in all probability, with a relatively small amount of mixed fission products - contaminated the fish externally, but the fact of this contamination was not appreciated until after the ship had docked at Yaizu and the catch had been delivered to market. In a surprisingly short time the fish were scattered in various municipal markets all the way to Osaka. The Japanese vigorously pursued the recovery of these fish as soon as the contamination was realized, and I believe that all, or very nearly all, of the fish of this cargo were recovered and destroyed. The impact of the press announcements was profound in Japan, and there was widespread apprehension that a large portion of the entire tuna catch might be heavily contaminated and deadly to persons coming into contact with the fish. Some portions of the Japanese press gave some basis for these fears.

I sent Mr. Merril Eisenbud of the Health and Safety Laboratory, New York Operations Office, to Tokyo on March 19 to assist in the collection of specimens for radiochemical analysis with particular reference to the problem of the Japanese fishermen. He was instructed also to look into the matter of the monitoring of tuna fish brought into Japan, with especial reference for those destined for export. On March 22 I talked with Mr. James K. Gribbett of the Food and Drug Administration concerning the monitoring of tuna fish coming into the United States, and offered the support of this office and the Health and Safety Laboratory in such a program to whatever degree might be necessary with respect to both personnel and equipment. They have been pursuing such monitoring at all of the ports of entry on the West Coast.

** Canned Tuna (1952)

Japan exported to U.S.A.	960,150	cases (48 7 oz. cans per case)
Japan exported to other countries	123,930	cases
	1,084,080	cases

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At the same time, we made arrangements for such monitoring at Honolulu, and I had two survey instruments dispatched by air for their use and asked Dr. Oscar Sette of the Pacific Oceanic Fishery Investigations in Honolulu to act as consultant to Mr. George Akau, the Food and Drug representative.

On receiving information from Mr. Eisenbud that the Japanese were conducting a thorough examination of incoming tuna and had found no significant contamination save on the fish of the Fukuryu Maru, and with the further consideration that about 2,000 tons of fish had come to a state of arrest and approximately 200,000 cases of packed tuna were involved in a panic situation, I requested Mr. Eisenbud to suggest to the Japanese that they proceed with the pack on the assurance that the chance of there being contaminated fish was negligible and that the American authorities do not act capriciously. This advice was passed by radio-telephone on March 25 and by message No. 2124 through the Department of State.

In conversations with the Food and Drug Administration involving Mr. James R. Cribbett, Mr. Wallace Jenson, and FDA Commissioner Crawford, it was agreed that the FDA could respond to a specific question with a re-assuring statement which could be released. It was concluded that the Ambassador could ask this question and the reply given to him to issue as a public statement, quoting the FDA. The matter was passed to Mr. Morse Salisbury at this point, and these moves were carried through and the statement was released in Japan by Ambassador Allison that the Food and Drug Administration felt there was no cause for apprehension.

I also talked with Mr. Ed Cameron, Washington representative of the National Canner's Association, and suggested to him that it might be well to advise the members of the Association that since the market was paralyzed due to psychological factors and panic, to suspend their normal operations might result in a spread of panic to the consumers market in this country. Mr. Cameron said he realized the importance of this and would informally so advise their membership.

Catch in the Marshall Area. We have reliable information from Mr. L. Shapiro, Fish and Wildlife Service and from Dr. Oscar Sette of the Pacific Oceanic Fishery Investigations in Honolulu that the Marshall Islands area, particularly that to the north of the Bikini atoll, is poor fishing ground for tuna, and that more than 1% of the total Japanese catch comes from this entire area. Prior to the war, when this group of islands were completely controlled by the Japanese, they did very little fishing in this region. It seems to have become popular with them now that the Marshalls are being used for weapons testing.

Currents and Sailing Problems. From the pilot charts published by the U. S. Hydrographic Office for the North Pacific, it appears that during this time of year there is a current through the Marshall Islands area that generally

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Tuna Fishing

goes westward at about 15 to 18 nautical miles per day. On approaching the Philippines this current sweeps northward and most of it enters the region to the east of Formosa. However, these currents are not well defined during this season of the year and on approaching Japan are confused and variable. South of the Marshalls, there is a counter current setting to the east which shifts with the season, but may reach a velocity of 15 miles per day. This current never seems to get as far north as the northern islands of the Marshalls.

Access to the southern tuna fishing areas in the region of the Solomons, Samoa and Gilbert Islands would not seem to be appreciably interfered with by the present danger area save in the case of the Gilbert Islands.

Contamination of Fish. Tuna fish have been caught in the northern Marshalls following the first detonation but results are not yet available. Fish caught after the MIKE shot of IVY 2-1/2 to 3-1/2 miles from the crater 8 days after the shot gave the following results:

1. Activity in whole fish (average) .5 μc/gram
2. Activity in Tissues - (Wet Weights)
   (a) Muscle - 1/6 μc/gram wet tissue (μc - microcurie)
   (b) Liver - 1 μc/gram
   (c) Gut - 3/4 μc/gram

From considerations of current, the depth of mixing of surface water, the rate of decay of fission products and the degree to which fish in contaminated water tend to absorb fission products, I reached the conclusion that the probability of significant contamination of fish outside the immediate test area is inconsequential and that in all likelihood we will be unable to detect these waters more than a few hundred miles away from the Marshall Islands. The attempt, of course, will be made to measure this contamination.

JCB

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LANDINGS OF TUNA AND TUNALIKE [illegible] COUNTRY

AREA & COUNTRY	1939 POUNDS	1939 PER CENT OF WORLD'S CATCH	1951 POUNDS	1951 PER CENT OF WORLD'S CATCH
Western Pacific				
Japan (offshore)	411,095,790	49.8	362,989,305	35.6
Formosa	14,764,680	1.8	15,121,890	1.5
Total	425,860,470	51.6	378,111,195	37.1
North America				
U.S.A.	182,604,870	22.0	324,105,000	31.8
Mexico	3,466,000	0.4	1,636,000	0.2
Total	186,070,870	22.4	325,741,000	32.0
South America				
Peru	1,293,012	0.2	131,171,040	12.8
Chile	1,320,795	0.2	10,295,145	1.0
Total	2,613,807	0.4	141,466,185	13.8

Central Pacific (Hawaii)

1951 .... 12,453,349 pounds

NOTE: World's catch increased from 825 million pounds in 1939 to 1 billion pounds in 1951.

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