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ABSTRACT

Radiobiological analysis of the reef fishes of Rongelap and Ailinginae Atolls indicated that a recontamination of the area occurred in 1956. Gross levels of beta activity in muscle tissue ranged from 0.016 to 0.038 uc/kg wet weight. The levels of radioactivity in bone and muscle tissues of fish collected during 1957 were about the same as the levels for similar tissues collected in 1955. Gamma spectra analysis and ion-exchange methods revealed the presence of Zn^{65}, Co^{57}, Co^{58}, Co^{60}, Mn^{54}, and Fe^{55}. Radiostrontium was found only in small amounts (about .0014 uc/kg wet weight) in the bone of fish from Kabelle Island, Rongelap Atoll. Approximately 40 per cent of the total radioactivity in the reef fishes was due to Zn^{65}, 28 per cent to cobalt, 26 per cent to Fe^{55}, and 6 per cent to other radionuclides.

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Introduction

During July 1957 collections of fish for radiobiological analysis were made at Ailinginae and Rongelap Atolls. The data from these collections represent part of the information from a continuing program of radiobiological studies which was begun on March 26, 1954, soon after the first radiological contamination of Rongelap and Ailinginae Atolls. Subsequent collections were made on July 16, 1954, January 29, 1955, and October 10, 1955. All of these investigations have been reported by Donaldson, et al. (1955). Data from the investigations in the Rongelap area by this Laboratory and other organizations have been summarized and coordinated by Dunning (1957). Results of the analyses of additional material collected August 3, 1956 are included in this report.

Materials and Methods

Fish were collected at Enibuk Island, Ailinginae Atoll, on July 11, 1957, by poisoning an area of the inner reef. One large grouper also was taken by hook and line in Mogiri Pass. On July 17, 1957, a collection was made in the lagoon in front of the village on Rongelap Island, Rongelap Atoll, and

on July 18, 1957, a collection was made in the channel off the northwest end of Kabelle Island, Rongelap Atoll. All fish were obtained in water 15 feet or less in depth, and the collections were made in localities almost identical to those of the 1954, 1955 and 1956 surveys. Locality, date of collection, common names, genera, species and number of specimens for the 1956 and 1957 collections are listed in the appendix.

The fish were placed on ice in insulated containers within two hours of capture and transported to the Eniwetok Marine Biological Laboratory where they were frozen. There the fish were identified and dissected, except in the case of fish collected in 1956 when the frozen fish were shipped to the base Laboratory at the University of Washington for dissection and subsequent radiological analysis. Tissues used for analysis were muscle, bone, liver and stomach contents or viscera. Specimens which were too small to dissect were processed as whole fish.

Partly because of the omnivorous food habits of the Marshallese natives and partly because of variations in the samples, it is advisable to analyze many specimens of a variety of species to obtain reliable estimates of levels of radioactivity (Welander, 1957). Consequently, two-gram samples of muscle tissue were taken from each fish and the aggregate was homogenized in a Waring Blendor. Plates were made of aliquots of this homogenate and the remainder dried for radiochemical analysis. All samples were dried at 100° C and the plated samples ashed at temperatures up to 540° C, cooled, slurried, dried and counted in

internal methane gas-flow counting chambers at the Laboratory of Radiation Biology in Seattle. Counts per plate were converted to disintegrations per minute per gram of wet tissue by correcting for sample weight, geometry, backscatter and self-absorption. For a more complete discussion of these procedures see Donaldson et al. (1953).

Other tissues were treated similarly, with the exception of liver, in which case the whole organ was removed from each specimen. If a sufficient number of specimens of a single species was obtained, the tissues were treated separately as in the case of goatfish and halfbeak from Kabelle Island (see Table 1).

Decay rates for radioactivity of tissues of fish collected in 1956 were calculated because there were indications that Rongelap Atoll was contaminated during the Redwing operation.

Gamma spectra and total gamma counts were made on dried or ashed samples in a single channel, 50-position, automatic advance, gamma spectrometer using a two-inch, well-type sodium iodide crystal. Chemical analyses were made by ion-exchange resin column and radiochemical precipitation techniques The radioactive isotopes contained in the separate fractions were identified by determination of the gamma energies, and by beta mass absorption studies using aluminum foil. Correction factors for converting beta and gamma counts to disintegrations per minute were calculated by the use of standards of known energies. Details of the procedures used are given by Lowman et al. (1957).

Table 1. Gross levels of beta radioactivity in reef fishes collected at Rongelap and Ailinginae Atolls, July 1957, expressed as uc/kg wet tissue*

Collection date and Locality	Common name	Number of specimens	Muscle	Bone	Liver	Stomach content	Whole fish
7/11/57 Ailinginae Atoll Enibuk I.	Reef fish	32	.038		.163		
	Reef fish	51					.030
	Grouper (*Plectropomus leopardus*)	1	.036	.100			
7/17/57 Rongelap Atoll Rongelap I.	Reef fish (carnivores)	26	.016	.022	.059	.026	
	Reef fish (omnivores)	24	.018	.020	.068	.063	
	Reef fish	73					.028
7/18/57 Rongelap Atoll Kabelle I.	Reef fish	11	.027	.102	.276	.125	
	Reef fish	36					.049
	Goatfish (*Mulloidichthys samoensis*)	14	.036		.727	.370	
	Halfbeak (*Hyporhamphus laticeps*)	50	.016		.080	.038	

*Counts were made during August 1957.