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RADIATION LEVELS IN BIOLOGICAL SAMPLES COLLECTED AT PONAPE, CAROLINE ISLANDS DECEMBER 15-16, 1954

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Following the series of experiments conducted at the Pacific Proving Ground , Marshall Islands, it became evident that contamination of foods of the people of Micronesia was entirely possible.

Facilities were not available for accomplishing an extensive survey of these islands; however, on occasion it was possible to make collections of native foods for an evaluation of the radioactive content. The Task Group, through the office of the United States Atomic Energy Commission Resident Engineer, requested the supporting military organizations at Eniwetok and Kwajalein Atolls to supply transportation for the expeditions. Such a collecting trip was made to Ponape, Caroline Islands, on December 15 and 16, 1954 by members of the Program 19.1 staff, the AEC Resident Engineer, Mr. Thomas Hardison, and Mr. Robert Taylor, Radiological Safety Officer, with Mr. Paul Zigman and Mr. Robert Rinehart, United States Naval Radiological Defense Laboratory, accompanying the expedition as guests.

We are indebted to Mr. Henry Hedges, District Administrator at Ponape and members of his staff for cooperation in providing facilities and aid in making the collections.

The materials collected were placed in plastic bags at the time of collection and taken either fresh or frozen to the Eniwetok Marine Biological Laboratory. There the samples were weighed and dried for shipment to Seattle. Ashing and counting were completed at the University of Washington. Sample preparation and counting methods were similar to those reported in WT-616 (UWFL-33).*

Extreme care was taken at all stages in the preparation and counting of the material to avoid contamination. No correction was made for decay; this factor, estimated from decay curves of Eniwetok and Bikini materials, would be between 1.1 and 1.2.

The results of counts of radioactivity of biological samples collected at Ponape on December 15 and 16, 1954, are listed in Tables 1, 2 and 3. Trace amounts of radioactive materials were found in most foodstuffs. As is often the case, the marine plankton contained the highest counts--12,500 d/m/g wet weight and 2,520 d/m/g wet weight--for the samples from the two nets fished.

Special attention should be called to the radioactive content of some of the tuna fish livers. The average count was 500 d/m/g wet weight for liver, although some yellowfin tuna livers contained twice this amount.

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*"Radiobiological studies at Eniwetok before and after Mike shot." Lauren R. Donaldson. Applied Fisheries Laboratory, University of Washington, Seattle, Washington, June 1953. (Confidential)

Ponape is the only extensive commercial fishery conducted by the inhabitants of the Trust Territory. About sixty tons of tuna per week are taken by Ponape fishermen for shipment to Guam. In an estimation of amounts of radioactivity ingested by the natives at Ponape from eating fish, it should be noted that livers are preferred to flesh. The usual practice is for the fishermen, their families and friends to eat the livers from the fish and sell the remainder. This practice results in a tenfold increase in the amount of potential radiation hazard for these people over the normal expectancy where only the muscle of the tuna is used for food.

The best estimate currently available to us of fish consumption in the Caroline Islands is about 250 grams per person per day. Because a major part of the 250-gram fish consumption is composed of liver, the amount of radioactive materials ingested by some of the native people may exceed the permissible levels for mixed fission products as given in the National Bureau of Standards Handbook 52.*

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*"Maximum permissible amounts of radioisotopes in the human body and maximum permissible concentrations in air and water." National Bureau of Standards, U.S. Department of Commerce, Washington, D.C.

Figure 1. Ponape natives displaying catch of yellowfin tuna. These people ate the livers of the fish as they were eviscerated.

Table 1. Radioactivity in Fish Collected at Ponape December 16, 1954

	Muscle		Liver		Bone		Gut		Skin	
	Net c/m/p*	d/m/g* (wet)	Net c/m/p	d/m/g (wet)	Net c/m/p	d/m/g (wet	Net c/m/p	d/m/g (wet)	Net c/m/p	d/m/g (wet)
Pelagic fish:										
Yellowfin tuna	59	102	785	1,460	31	126				
" "	93	89	602	1,020	28	122				
" "	50	88	266	504	18	82				
" "	70	92	595	924	31	120				
" "	37	37	229	231	19	71				
" "	50	67	230	312	21	88				
Bonito	51	75	131	135	26	100				
"	6	10	75	118	12	48				
"	15	20	125	179	14	47				
"	20	29	76	96	19	68				
Average		60		500		87				
Reef fish:										
Surgeonfish	17	19	5	5	6	18	10	21	12	18
Grouper	14	19	30	140	10	55	33	69	11	27
Goatfish	8	14	12	46	8	37	29	45	9	18

*c/m/p: counts per minute per plate.
d/m/g: disintegrations per minute per gram.

Table 2. Radioactivity in Plankton and Invertebrates Collected at Ponape December 16, 1954

		Net c/m/p*	d/m/g (wet)*
Plankton	(1/2-meter net, No. 6 mesh, 15-min. tow)	2,755	12,500
	" " " No. 20 "	634	2,520
Invertebrates	Sea cucumber, gonad	47	110
	" " "	139	289
	" " gut	26	30
	" " "	30	136
	" " integument	21	37
	" " "	36	85
	Coral	10	206
	"	10	140
	"	12	74
	Snail, shell	11	71
	" soft parts	81	180

*c/m/p: counts per minute per plate.
*d/m/g: disintegrations per minute per gram.

Table 3. Radioactivity in Marine and Land Plants Collected at Ponape December 16, 1954

Plant	Tissue	Net c/m/p**	d/m/g (wet)**
Halimeda sp.	Entire	6	47
"	"	6	132
	"	8	51
Eel grass	Leaves	28	60
"	"	6	12
"	"	13	40
Papaya	Skin	30	50
"	Seeds	12	21
"	Pulp*	6	9
"	Skin	7	11
"	Seeds	14	25
"	Pulp*	15	20
Breadfruit	Skin	23	41
"	Pulp*	13	20
"	Stem	30	39
Arrowroot	Cortex*	22	35
"	Rachis	13	23
"	Leaves	23	38
"	Pulp*	10	15
"	"	12	18
Coconut	Milk*	43	5
"	Meat*	11	18
"	Milk*	76	8
"	Meat*	12	18

*Edible portions.
**c/m/p: counts per minute per plate.
**d/m/g: disintegrations per minute per gram.