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College of Fisheries
Laboratory of Radiation Ecology

August 23, 1974

Mr. Roger Ray
Asst. Manager for Operations
USAEC, Nevada Operations Office
P. O. Box 14100
Las Vegas, Nevada 89114

Dear Mr. Ray:

A second supplement to the 1973-74 Johnston Atoll contract was in the amount of \$5977 for the analyses of samples collected at Rongelap and Bikini in April, 1974. A report of the first results of analyses was submitted to Mr. Tommy McCraw, DOS, on 3 July, and a copy of that letter is attached. Following is a report of the results of the analyses for the remaining samples.

Plutonium, iron-55 and strontium-90 analyses, except for one strontium-90 sample that was lost, have been completed for 38 samples of soil, fish and coconut crabs collected on Bikini Island and Rongelap Atoll in April, 1974. The results of these analyses are given in Tables 1a, 2a, 3a, 4, 5a and 5b. Relative to the 3 July report, Tables 1a, 2a, 3a, 5a and 5b supplement Tables 1, 2, 3 and 5, and Table 4 replaces Table 4.

In the soil samples, most of the ^{90}Sr , Pu, and gamma-emitting radionuclides were in the top 25cm of the profiles.

Strontium-90 levels in the coconut crabs were greater for the Bikini than for the Rongelap samples and, as expected, the greatest tissue concentration was in the exoskeleton. The levels of ^{90}Sr in the coconut crab collected on Bikini Island in 1974 fall at the lower end of the range of values reported by Held (1971, NVO-269-8) for coconut crabs collected on Bikini Island in 1969.

Two samples, the 0 to 2.5 cm increment from soil profile #2 and the Bikini crab exoskeleton, are being reanalyzed for ^{90}Sr because of inconsistent values for the first two analyses. Mullet and goatfish collected near Bikini Island in 1974, compared with fish collected there in 1969 (Held, 1971), had similar levels of ^{90}Sr but lower levels of ^{55}Fe .

Except for the two samples being reanalyzed, this completes the analyses of samples described in the Second Supplement to the 1973-74 Johnston Atoll program. We are presently analyzing the remainder of the samples collected during the April, 1974, trip to Utirik, Rongelap and Bikini Atolls as part of the 1974-75 Johnston Atoll program. Results of these analyses will be forwarded to you as they become available.

During the current year, we will coordinate our program, especially the field work, with Dr. Nat Greenhouse and other members of Brookhaven's ecology program for Rongelap and Bikini Atolls. A copy of our proposed program has been given to Dr. Greenhouse but we have not received a copy of the Brookhaven program.

This report completes the final report for the 1973-74 Johnston Atoll program and, with this submission, payment of the final 10% of the contract [Contract AT(26-1)-269; U of W budget 61-9101] is kindly requested.

Sincerely yours,

AHS:ah
Enc.

Allyn H. Seymour
Director, Laboratory of
Radiation Ecology

cc: Tommy McCraw
John Stewart
Ms. Z. Sancho

Preliminary Data

Table 1a. Strontium-90 and plutonium in soil from Profile #1, collected April 1974 on Bikini Island behind the first house south of the center baseline road.

Depth cm	pCi/g, dry*		
	⁹⁰ Sr	^{239,240} Pu	²³⁸ Pu
0 - 2.5	16 ± 2.1	0.44 ± 0.02	-
2.5 - 5	22 ± 2.9	0.53 ± 0.03	-
5-10	19 ± 1.0	0.42 ± 0.05	-
10 - 15	14 ± 1.4	0.76 ± 0.02	0.001 ± 0.0005
15 - 25	14 ± 0.7	1.3 ± 0.04	-
25 - 50	15 ± 1.4	0.29 ± 0.01	-
50 - 75	8.6 ± 0.56	0.40 ± 0.02	0.002 ± 0.001
75 - 100	4.8 ± 0.58	0.20 ± 0.03	0.015 ± 0.007
100 - 115	9.4 ± 0.52	0.48 ± 0.01	-
115 - 130	0.32 ± 0.02	-	-

* The error terms are one-standard deviation and include errors associated with the chemical procedures, plus counting errors.

Preliminary Data

Table 2a. Strontium-90 and plutonium in soil from Profile #2, collected April 1974 on Bikini Island next to old coconut tree row #24 and just south of the center baseline road.

Depth cm	pCi/g, drv*		
	⁹⁰ Sr	^{239,240} Pu	²³⁸ Pu
0 - 2.5	5.8 ± 0.53	0.84 ± 0.04	0.0059 ± 0.002
2.5 - 5	20 ± 2.8	0.76 ± 0.05	-
5 - 10	17 ± 1.2	0.82 ± 0.02	-
10 - 15	15 ± 1.4	0.63 ± 0.02	-
15 - 25	10 ± 1.1	0.44 ± 0.05	0.03 ± 0.01
25 - 50	7.2 ± 0.48	0.21 ± 0.01	-
50 - 75	2.5 ± 0.21	0.38 ± 0.01	-
75 - 100	3.0 ± 0.38	0.077 ± 0.005	0.002 ± 0.001
100 - 125	0.23 ± 0.04	0.0077 ± 0.002	-

* The error terms are one-standard deviation and include errors associated with the chemical procedures, plus counting errors.

Preliminary Data

Table 3a. Strontium-90 and plutonium in soil from profile #3, collected April 1974 on Bikini Island next to old coconut row #24, just north of the first baseline south road.

Depth cm	pCi/g, drv*		
	⁹⁰ Sr	^{239,240} Pu	²³⁸ Pu
0 - 2.5	370 ±50	9.3 ± 0.1	0.0095±
2.5 - 5	310 ±15	9.2 ± 0.4	0.014 ± 0.005
5 - 10	150 ± 6.6	2.6 ± 0.05	0.001 ± 0.0005
10 - 15	99 ± 4.6	2.5 ± 0.06	-
15 - 25	81 ± 5.9	2.3 ± 0.05	0.0045± 0.001
25 - 35	13 ± 0.86	0.19 ± 0.01	0.037 ± 0.003
35 - 50	0.24± 0.09	0.022± 0.001	-
50 - 75	-	0.045± 0.004	-
75 - 100	-	0.084± 0.007	0.004 ± 0.001

* Error terms are one-standard deviation and include errors associated with the chemical procedures, plus counting errors.

Preliminary Data

Table 4. Radionuclides in individual coconut crabs collected in April 1974 on Bikini Island, Bikini Atoll, and on Arbar, Busch, and Kabelle Islands, Rongelap Atoll.

Sample No.	Island	Carapace Length (mm)	Tissue	pCi/g, drv*				90 Sr	239,240 Pu**
				40K	60Co	137Cs	137Cs		
388	Bikini	135	Muscle	13 +5.5	2.2 +.44	380 +4.2	16 + 1.0	0.018+0.002	
390	"	"	Hepato-pancreas	2.0+1.3	2.0 +.10	93 +0.7	36 + 2.6	0.025+0.005	
391	"	"	Exo-skeleton	1.4+1.2	0.14+.04	70 +0.6	1600 +170	0.021+0.007	
393	Kabelle	140	Muscle	6.6+1.0	0.43+.10	84 +1.3	6.6+ 0.34	0.033+0.008	
394	"	"	Hepato.	5.3+2.2	1.9 +.19	33 +0.52	19 + 1.1	0.014+0.001	
395	"	"	Exoskel.	1.1+0.4	0.07+.02	9.8+0.06	180 +13	0.016+0.003	
408	Kabelle	125	Muscle	9.7+1.9	0.56+.12	55 +0.58	3.3+ 0.23		
409	"	"	Hepato.	2.8+1.2	1.7 +.10	18 +0.31	5.2+ 0.56		
410	"	"	Exoskel.	1.4+0.5	0.08+.03	9.5+0.08	180+ 8.2		
384	Kabelle	110	Muscle	9.5+2.2	0.37+.17	46 +0.64	4.8+ 0.33		
385	"	"	Hepato.	3.5+1.2	1.3 +.09	15 +0.24	14 + 1.9		
386	"	"	Exoskel.	1.4+0.4	0.08+.02	7.7+0.06	210 +10		
405	Busch	140	Muscle	9.5+1.9	0.30+.12	30 +0.47	2.0+ 0.18		
406	"	"	Hepato.	3.0+0.9	0.51+.06	12 +0.29	7.9+ 2.1		
407	"	"	Exoskel.	1.4+0.4	ns	4.4+0.05	91 + 6.6		
396	Busch	100	Muscle	9.0+2.2	0.20+.06	40 +0.59	3.5+ 0.35		
397	"	"	Hepato.	3.1+1.2	0.82+.09	14 +0.20	11 + 2.4		
398	"	"	Exoskel.	ns	ns	4.5+0.31	160 + 6.9		
399	Arbar	140	Muscle	7.7+1.8	0.28+.07	38 +0.75	1.1+ 0.18		
400	"	"	Hepato.	3.5+1.0	0.34+.06	13 +0.31	2.8+ 0.31		

Preliminary Data

Table 4 (cont)

Sample No.	Island	Carapace Length (mm)	Tissue	pCi/g, dry*				
				^{40}K	^{60}Co	^{137}Cs	^{90}Sr	$^{239,240}\text{Pu}^{**}$
401	Arbar	140	Exoskel.	1.8±0.4	0.04±.02	7.0±0.05	74 ±4.1	
402	Arbar	135	Muscle	9.2±1.0	0.20±.07	27 ±0.21	1.5±0.20	
403	"	"	Hepato.	3.1±1.2	0.20±.04	12 ±1.2	2.6±0.16	
404	"	"	Exoskel.	1.4±0.8	0.02±.01	4.9±0.19	53 ±3.8	

* The error terms for ^{40}K , ^{60}Co , and ^{137}Cs are the two-sigma, propagated counting errors for single samples, while the error terms for ^{90}Sr and $^{239,240}\text{Pu}$ are one-sigma analytical errors.

** Only six samples of coconut crab were analyzed for $^{239,240}\text{Pu}$.

Preliminary Data

Table 5a. Strontium-90 and plutonium in fish collected on 12 April 1974, at Bikini Island.

Common Name	Tissue	No. of Fish	Size mm	pCi/g, drv*		
				⁹⁰ Sr	^{239,240} Pu	²³⁸ Pu
Goatfish	Entire	1	175	0.06±0.01	0.004±0.001	-
Mullet	E. whole	3	205-230		0.020±0.006	-
Mullet	E. whole	2	250,255	0.18±0.06	0.045±0.004	0.002±0.001

* Error terms are one-standard deviation and include errors associated with the chemical procedures, plus counting errors.

Preliminary Data

LRF
19 Aug. 1974

Table 5b. Iron-55 in fish collected on 12 April 1974 at Bikini Island, Bikini Atoll.

Species	Tissue	No. of Fish	Size mm	pCi/g, dry*
				⁵⁵ Fe
Goatfish	Entire	1	175	16 ± 0.1
Mullet	E. whole**	3	205-230	10 ± 0.1
"	Viscera	3	"	33 ± 0.2
Mullet	E. whole	2	250,255	11 ± 0.1
"	Viscera	2	"	82 ± 0.1

* Error terms are one-standard deviation and include errors associated with the chemical procedures, plus counting errors.

** Eviscerated whole samples include the entire fish, less viscera.