

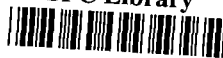
REPORT: SPC - CONFERENCE

CIGUATOXIN  
INSTITUT DE RECHERCHES MEDICALES  
Papeete, Tahiti

RADIOIMMUNOASSAY RESULTS - 1977-1978

- I. Report to the South Pacific Commission on radioimmunoassay testing of fishes from Tahiti and from fishes, Hawaii State Board of Health.
- II. Results summarized in table of RIA testing of documented clinically confirmed ciguatera poisoning from various parts of the country.
- III. Results summarized in table of fishes from National Marine Fishery Service, U.S.G.
- IV. Results of fishes from Division of Fish and Game, State of Hawaii.

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## Report to SPC

### Radioimmunoassay Testing of Fish for Ciguatoxin

This report encompasses results of two areas of study with the newly developed radioimmunoassay (1) for the detection of ciguatoxin:

1. Examination of fishes from Tahiti.
2. Routine testing of Seriola dumerili (Risso) - Kahala.

#### 1. Tahiti fishes:

The radioimmunoassay (RIA) test results in detail on the fishes from Tahiti are listed in table 1 together with the tests (Cat, MLD, and Mu) carried out by the Institut De Recherches Medicales, "Louis Malarde" in Tahiti. Comparisons of the RIA, MLD and Mu values are shown in figures 1 and 2 respectively. The calculated coefficient of correlation values ( $r = -0.545$  for RIA versus MLD, and  $r = 0.564$  for RIA versus Mu) suggest moderate to good correlation between these tests. There is no doubt, however, that the RIA test has greater sensitivity which accounts for the lack of an excellent correlation. It remains to be determined whether the detected levels of ciguatoxin by the RIA test is specific. Nonetheless, the RIA test can distinguish a toxic from a non-toxic fish. The Tahiti findings are similar to the eel's from Johnston Island (see reference 1).

#### 2. Hawaiian fishes:

The RIA results of these preliminary examination are shown in table 2 for Kahala routinely caught and sold commercially. Table 2 also include results of recent suspected cases of ciguatera toxicity in Hawaii.

#### Reference:

1. Hokama, Y., Banner, A. H., and Bayland, D. A radioimmunoassay for the detection of ciguatoxin. Toxicon <sup>15</sup>; 317-325, 1977.

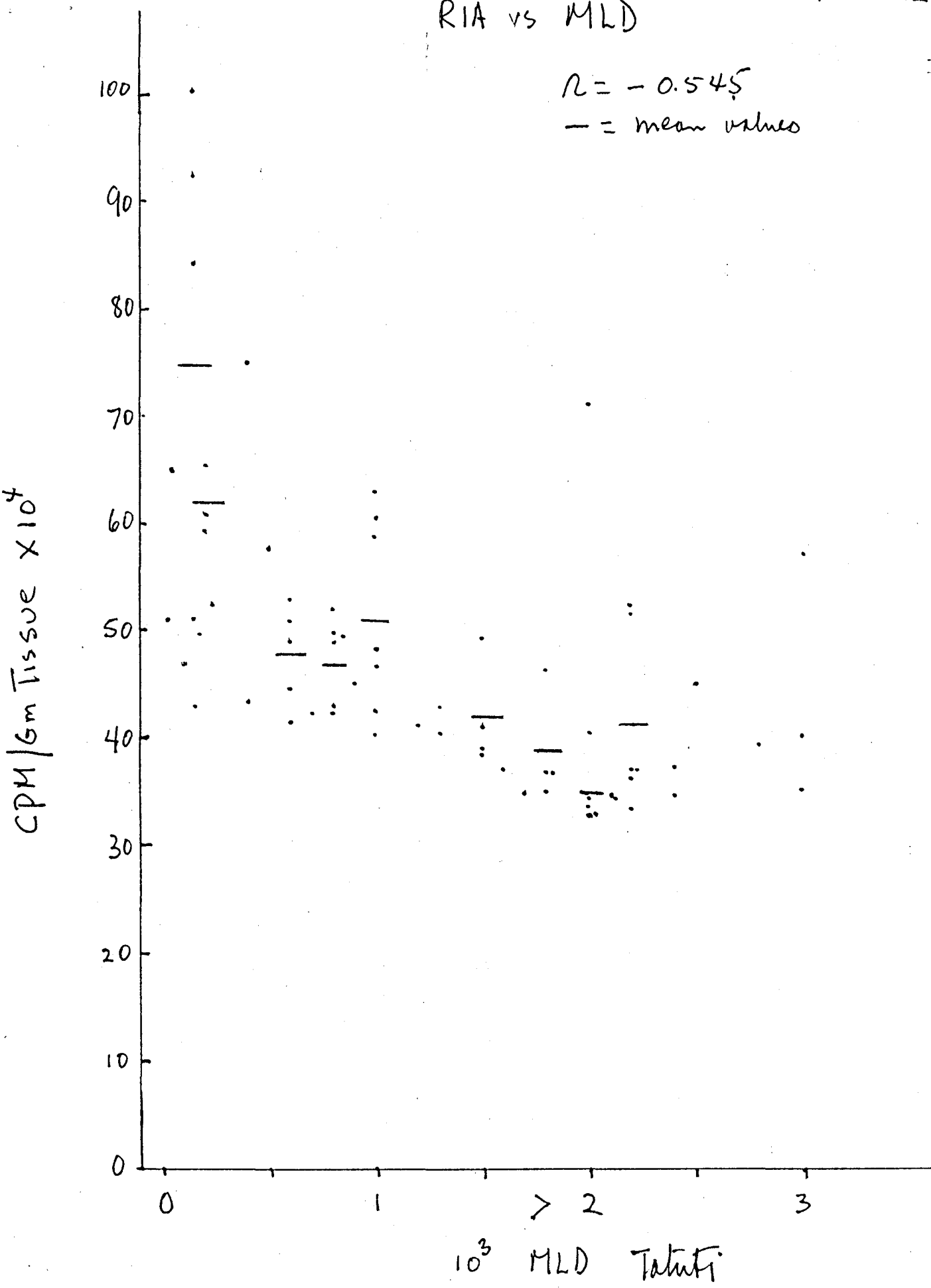
Table 1. RIA of Tahitian Fishes

Sample No.	Radioimmunoassay test		Tahiti Tests	
	RIA: cpm/gm tissue	Cat	MLD	M.U.
3868	355,938	0	>1800	<0.75
3864	338,622	0	>2200	<0.85
3869	371,578	0	2200	0.77
3868	361,349	0	>2200	<0.90
3859	423,426	0	1000	1.48
3857	338,451	0	2000	0.95
3867	353,345	0	>1700	<0.81
3862	372,146	0	>1600	<0.81
3872	370,740	0	>2400	<0.84
3879	355,306	0	*	*
3885	450,100	5A4	900	1.45
3884	419,868	1T4	600	2.08
3878	374,938	0	3000	*
3886	358,043	5A5	3000	0.99
3863	378,025	0	>2200	0.85
3842	520,589	0	800	2.26
3855	436,510	1T4	400	3.0
3873	390,025	5T5	1500	1.5
3731	498,768	5T5	850	2.7
3837	476,545	0	*	*
3893	368,530	2T5	1800	0.88
3864	344,669	0	>2100	<0.85
3892	402,718	0	1000	2.29
3888	368,222	0	1800	0.80
3849	481,523	1T2	1000	2.22
3874	344,173	0	2400	0.81
3876	404,076	1T3	1300	1.5
3836	508,742	1T3	600	3.18
3858	328,419	0	>2000	<0.89
3865	405,106	0	>3000	<0.80
B-549	509,272	1T4	150	10.0
3844	574,241	2T2	3000	0.92
B-548	431,987(1low)	1T4	150	10.0
3829	609,793	0	200	6.26
3866	403,561	0	>2000	<0.80
E6	493,767			
E8	355,031			
E9	393,041			
3827	404,754			
3889	395,935			
3852	524,820	0	2800	0.82
3900	428,136	0	*	*
3871	421,867	5T3	1300	0.83
3891	497,450	2T5	800	2.41
3887	428,058	5A2	180	9.22
3882	443,664	5T5	800	1.34
3856	413,444	5T5	600	2.32
3875	528,111	0	1500	1.14
B-545	842,776	1T4	600	3.2
3831	484,271	1T4	150	10.0
3896	462,928	0	1800	0.9
E4	516,589			
E2	632,706			

Sample No.	Radioimmunoassay test		Tahiti Tests		
	RIA:	cpm/gm tissue	Cat	MLD	M.U.
3877		522,661	4T2	225	8.5
3733		495,490	0	*	*
3833		629,630			
E		564,316			
E7		579,352			
3846		769,621	0	*	*
3826		803,630			
3830		613,268			
3839		468,467	2T5	100	12.94
3840		382,445	0	>1500	<0.81
B-544		922,774	1T4	150	10.0
B-547	1,	056,457	1T4	150	10.0
3880		607,322	2T4	1000	3.0
3847		758,165	0	*	*
3734		439,463	0	*	*
3853		493,866	0	>1500	<0.85
3845		714,156	1T2	2000	2.55
3895		488,869	2T2	600	2.40
3899		487,333	2T4	800	1.6
3854		413,470	0	>1200	<0.84
3832		487,043			
3728		525,567	0	>2200	<0.81
3730		519,300	0	>2200	<0.85
3851		565,867	0	*	*
3861		708,937	0	*	*
3732		579,087	1T4	500	1.93
3735		714,442	0	*	*
3835		737,935			
3883		582,344	0	*	*
3898		593,448	3T5	210	6.8
3828		719,081			
3841		345,278	0	>2000	<0.91
3848		656,358	2T5	200	9.0
3736		457,217	0	2500	0.85
3850		751,119	1T4	400	4.0
3894		630,019	1T2	1000	2.0
3838		650,939	2T5	50	23.6
3881		507,740	1T4	40	*
3897		536,324	0	1000	1.6
3870		464,832	3T5	1000	1.5
3890		620,800	2T3	350	5.95

# RIA vs MLD

$r = -0.545$   
— = mean values

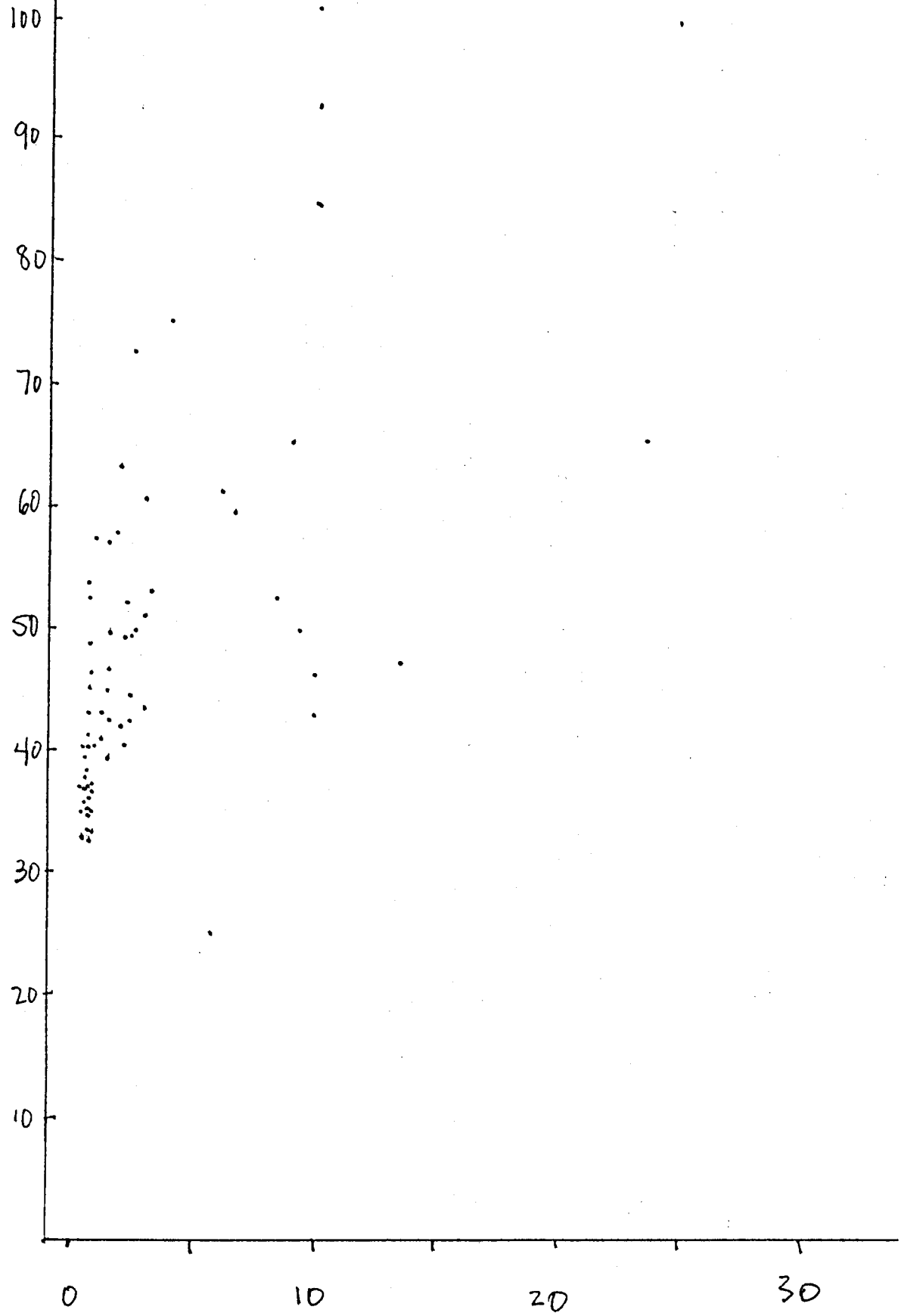


R1A vs M.U.

FIGURE 2

$r = 0.564$

cpm/gm tissue  $\times 10^4$



M. U. Tahiti

TAHITI STUDIES

	<u>Cat vs MLD</u>	<u>Cat vs M.U.</u>	<u>MLD vs M.U.</u>
Coefficient of correlation (r)	-0.625	0.41	-0.64

Radioimmunoassay Studies

	<u>RIA vs Cat</u>	<u>RIA vs M.U.</u>	<u>RIA vs MLD</u>
Coefficient of correlation (r)	0.394	0.564	-0.545

Table 2. RadioImmunoassay Examination of Hawaiian Fishes  
and Clinically Suspected Ciguatera Poisoning.

Sample no.	cpm/gm tissue		Remarks
<hr/>			
Kahala (United Fish Agency)		weight(lbs)	
H- 1	291,833	19	all marketed fishes
2	297,391	21	" " "
3	320,124	15	" " "
4	306,124	15	" " "
5	348,481	41	" " "
6	378,139	14	" " "
7	341,599	20	" " "
8	332,535	22	" " "
9	266,951	20	" " "
10	359,798	19	" " "
11	332,829	16	" " "
12	278,931	15	" " "
13	363,460	16	" " "
14	323,668	12	" " "
15	334,140	20	" " "
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Fish from Hawaii State laboratory			
B-4977	463,039		suspected ciguatera poisoning (Uhu)
Anjo	524,106		suspected ciguatera poisoning (fish?)
H-16	463,636		suspected ciguatera poisoning (rainbow fish)
Kuroda	375,781		suspected ciguatera poisoning (grouper?)



RIA RESULTS OF FISHES FROM  
CLINICALLY CONFIRMED CIGUATERA POISONING

<u>No. of Samples</u>	<u>CPM/GM Tissue</u>	<u>Results</u>
19	370,597 - 711,346 (483,455 ± 79,830)	Positive

Fishes: *Cheilinus rhodochrous*, parrot fish, rainbow runner; *Carnx cheilio*, *Seriola dumerili*, amberjack, *Epinephelus mario*.

Sources: Hawaii State Health, California State Health (Midway fishes); Virgin Islands, and State Health, Florida.

Table 2. Clinical confirmed Ciguatoxin poisoning

<u>Source</u>	<u>no. individuals</u>	<u>fish</u>	<u>cpm/gm. tissue</u>
State Health Department (Kona)	8(2 cats)	<u>C. rhodochrous</u>	1. 583,422
		(po'ou)	2. 429,489
		wrasse	3. 419,822
State Health	family	parrot fish (uhu)	463,039
State Health	family	?	524,106
State Health	family	Rainbow	463,636
State California fishes caught near Midway samples	8-9 persons	<u>Carnx Cheilio</u>	
1			497,406
2			711,346
3			370,597
4			505,779
5	492,634		
State Health	family	Uhu	421,064
State Health	family	kahala	415,870
State Health	family	kahala	549,938
West Indies	6	<u>Seriola dumerili</u>	545,534
Midway	4	amberjack	447,045
Miami, Florida: Dade County Dept. Public Health		<u>Epinephelus</u> <u>mario</u>	
sample 1	6		479,339
2 *	15		375,189
3	4		490,392

\* These individuals ate stew prepared from several grouper heads and backbones (weighing 20-30 lbs.). Question is whether all the fishes were toxic or not and whether the fish tissue (flesh) we received came from a toxic fish head or backbone is uncertain.

RIA RESULTS OF FISH TISSUES  
 SURVEY OF LEEWARD ISLANDS  
 NATIONAL MARINE FISHERY SERVICE

<u>No. of Samples</u>	<u>Tissues Examined Side (Fillet)</u>	<u>Percentage</u>	<u>Results</u>
74	189,067 - 348,256 (274,738 ± 38,195)	92.5	Negative
4	356,993 - 382,338 (364,892 ± 11,998)	5.0	Borderline
2	400,794 - 406,436 (403,615 ± 3,989)	2.5	Positive

RIA RESULTS OF FISH TISSUES  
 SURVEY OF LEEWARD ISLANDS  
 NATIONAL MARINE FISHERY SERVICE

<u>No. of Samples</u>	<u>Tissues Examined Belly Area</u>	<u>Percentage</u>	<u>Results</u>
58	168,467 - 350,333 (298,429 ± 25,907)	92.0	Negative
2	373,111 - 383,981 (378,546 ± 7,686)	3.2	Borderline
3	414,157 - 511,500 (459,511 ± 49,009)	4.8	Positive

RIA RESULTS OF FISH TISSUES  
 SURVEY OF LEEWARD ISLANDS  
 NATIONAL MARINE FISHERY SERVICE

<u>No. of Samples</u>	<u>Tissues Examined Gonad</u>	<u>Percentage</u>	<u>Results</u>
39	138,267 - 326,067 (240,639 ± 45,422)	67.2	Negative
7	357,333 - 399,966 (376,368 ± 15,893)	12.1	Borderline
12	410,143 - 720,489 (475,116 ± 84,938)	20.7	Positive

RIA RESULTS OF *CARANGOIDES AJAX*  
Obtained from French Frigate, Maro Reef,  
Laysan, Lisianski, Pearl and Hermes

DIVISION OF FISH AND GAME, STATE OF HAWAII

<u>No. of Samples</u>	<u>CPM/G Tissue Range</u>	<u>Results</u>	<u>Percentage</u>
24	204,034 - 344,253	Negative	78.4
5	356,996 - 392,110	Borderline	16.1
2	404,050 - 433,000	Positive	6.5

Weight of samples from 2.5 to 85.0 lbs.

RIA RESULTS OF  
*CHEILINUS RHODOCHROUS* ROUTINELY OBTAINED  
DIVISION OF FISH AND GAME, STATE OF HAWAII

<u>No. of Samples</u>	<u>CPM/GM Tissue Range</u>	<u>Results</u>
2	297,051 - 320,987	Negative
2	351,254 - 376,084	Borderline
10	402,450 - 549,758	Positive

Weights of fishes 0.2 to 2.2 lbs.; samples from  
French Frigate, Lisianki, Maro Reef and the majority  
from Pearl and Hermes (8).



COEFFICIENT OF CORRELATION VALUES  
AS DETERMINED BY LINEAR REGRESSION  
ANALYSIS FOR *CHEILINUS RHODOCHROUS*\*

<u>No. of Fishes</u>	<u>Source</u>	<u>Length vs. RIA Coefficient of Correlation=R</u>	<u>Weight vs. RIA Coefficient of Correlation=R</u>
4	Lisianski	0.41	0.79
8	Pearl and Hermes	0.79	0.64
12 (total)		0.66	0.61

\*Though the number of fishes are small from each source, a fairly good correlation exists between RIA vs. length and RIA vs. weight of fish in the total cumulative analysis.

RIA RESULTS OF OUTBREAK OF KAILUA-KONA  
CIGUATERA POISONING FROM *CHEILINUS RHODOCHROUS*  
STATE HEALTH DEPARTMENT

<u>No. of Samples</u>	<u>CPM/G Tissue Range</u>	<u>Results</u>
6	330,000 - 350,000	Negative
5	354,000 - 394,155	Borderline
3	419,822 - 583,422	Positive

Weight of fishes ranged from 1/2 to 5 lbs. All caught in the same location - Kawaihae. Eight individuals (ate body and head) and two cats (ate stomach and other organs) were affected.