

30 March 1954

Dr. Yoshio Hiyama
Professor, Fisheries Institute
Faculty of Agriculture
Tokyo University
Hongo, Tokyo
Japan

Dear Dr. Hiyama:

We are extremely sorry to hear about the accident to the Japanese tuna fishermen who were operating the long line in the area near Bikini Island during the last atomic explosion. We will try our best to answer your questions and furnish you with as much information as possible to help solve your problems.

Your first question is impossible for us to answer and we are referring it to our Director, Dr. Lauren R. Donaldson, who might have some information that would be available to you. In any event he will probably write you in the near future regarding this and other questions noted here.

In reference to your second question we are enclosing some data regarding permissible amounts of radioactivity for human consumption under emergency conditions. This will give you some idea how to evaluate your own problem. It is possible similar data is already in your hands.

The third question can be answered in part by the enclosed publication, AECD-3446. In general the following remarks might be pertinent for immediate use and might partially relieve your anxiety.

You will note from our researches that the radioactivity is least in the muscle tissue, even in heavily contaminated fish found close to the blast center. On the other hand the radioactivity is highest in the stomach contents and in the liver. This is also true in the invertebrates. Much of the contamination from radioactive materials is external, usually only in the superficial layers of the skin. We believe here that such is the case of your tuna and other fishes taken in the flag lines or contaminated from fall-out material (from the atmosphere) on the decks of your ships or in the holds. We definitely urge that you carefully remove the skin of the fish samples you assay and evaluate the radioactivity from muscle alone. Similar analysis should be made of liver, ovaries and other parts of the fish that are used for food. Usually, the muscle should be quite low in radioactivity.

Another factor that is important is the length of the half-life of the radioactive materials present in the organisms. If the half-life is comparatively short, storage for some time will probably bring the radioactivity to a permissible level. Our experience has been that most of the radioactivity after the blast is comparatively short-lived. You should make sequential counts of the same tissue to determine the half-life in your material.

The concentration of radioactive materials is greatest, of course, near the blast center and diminishes out from there, except for certain local concentrations built up because of wind, currents, or rainfall which might carry fallout material. In the fauna the concentration of radioactive materials is greatest in the invertebrates, somewhat less in omnivorous and herbivorous fishes of the bottom and the reefs, and much less in the carnivorous fishes of the reefs. Radioactivity in pelagic fish off the reefs and just outside the lagoon is usually absent or very low.

We have just been reading of the account of the Japanese fishermen in LIFE MAGAZINE and we have some idea of the circumstances with which you and the Japanese fishing industry are faced.

The radioautograph of the shark flesh in the article in LIFE MAGAZINE appears to be due to a chemical reaction on the film and not due to radioactivity. It is possible that moisture from the flesh gained access to the film and produced the picture shown in the magazine. We would like more details concerning the production of this photograph if you have them. If the shark was taken by the "Fortunate Dragon" we would be positive that the radioactivity would not have been able to reach the muscle tissue. There would not have been time for the fish to swallow the ash, digest it and distribute the elements throughout its system. This, coupled with the fact that the so-called X-ray picture of the shark flesh looks like nothing we have made in the way of radioautographs, indicates that you were right in intimating that the dangers from radioactive fish were exaggerated.

The recent bombs at the Eniwetok Proving Grounds will have the activity expected from the usual atom bomb plus the induced radiation. Induced radioactivity in this area will naturally include Calcium 45, because calcium is a common element in the area, and other elements such as sodium.

We sincerely hope that this material will help you in your efforts to solve your problem. Please feel free to write us for more information that you might need. We will answer to the best of our ability. We would like to be kept informed of your progress as well as of the problems that arise and your method of meeting them if your time will permit.

Yours sincerely,

A. D. Welander

LEVELS OF RADIOACTIVITY IN WATER AND FOOD THAT
CAN BE PERMITTED UNDER EMERGENCY CONDITIONS
FOLLOWING AN A-BOMB BLAST OR OTHER
NUCLEAR EXPLOSION

Radioactive contamination of water supplies and of food may become a significant hazard following some types of nuclear explosions. The level of radioactivity that can be permitted in water will general be inversely proportional to the time this water is used for human consumption. On this premise, Table I has been formulated to furnish guidance as to acceptable values of radioactivity in water during a period of emergency immediately following a nuclear explosion.

TABLE I

Emergency levels for radioactivity in drinking
water in period immediately following nuclear
explosion

Time Water Is To Be Consumed	Acceptable Beta-Gamma Activity		Acceptable Alpha Acti	
	microcuries per cc	disintegrations per min. per cc	microcuries per cc	disinteg per min p cc
10 days	9×10^{-2}	2×10^5	5×10^{-3}	1.1×10^4
One month	3×10^{-2}	7×10^4	1.7×10^{-3}	3.7×10^3

Scope of These Emergency Values

It is emphasized that these are not peacetime permissible limits of radioactivity for either long-or short-term consumption. Responsible officials can utilize these values during periods of emergency with the conviction that water with radioactivity falling below these limits can be used with no real hazard.

The beta-gamma values do not apply for periods later than one month after a nuclear explosion, since the longer lived radioactivity remaining carries an increasing hazard for human consumption. These values can be considered as applying to food as well as water.

Monitoring Instruments for Detecting Food and Water Contamination

These acceptable radioactivities are substantial in terms of presently available portable monitoring instruments. Emergency radiation monitoring teams will find it possible to measure these concentrations of radioactivity with their standard equipment.



Dr. Author D. Welander
Fisheries school,
U. of Washington.
Seattle, USA

March 23rd, 1954

Dear Prof. Welander,

I suppose you may know the recent accident, through new papers, that the Japanese tuna fisherman operating the long line in the area near Bikini island in Marshal Islands were wounded by getting the ash of atomic bomb which has radio activity.

As the fishermen were ignorant about the matter, the fish brought back by that boat was landed and sold to various place, before they went to the hospital appealing ichu and found it was caused by the radio activity. The fish sold were examined ~~were~~ and found enough radio activity to be dangerous as food, and the government food examination system was mobilized to find out it already distributed through out the country. And, already almost of all the fishes, tunas and sharks, which brought in by that boat were found and under safety disposal. However, peoples were so frightened psychologically by rather exaggerated news, the government food examination system is still carrying on the examination about the fishes landed by the tuna fishing boats coming back from the South Pacific area from the stand point of food hygiene.

Being an ichthyologist who ever worked in that area I have been embarassed by so frequent questions both from the government and people about the safety to eat the fish caught in that area, because I have very poor knowlege on the fish related with the radio activity. The only knowlege we have by the experience at Hiroshima and Nagasaki is seems to me unappliable to this new type of bomb, about which scientific data we have no means to obtain.

While I was running about for this problem, as the most of fish markets were closed by the fear of people, I was visited by Dr. Bruce W. Halstead, College of Medical Evangelists, Loma Linda, California, who came over here with the job about the Pacific poisonous fishes, about which I worked some about ten years ago, and since he started his new investigation I am cooperating as far as I can. Then I asked the question about this matter as I thought the matter would be already worked out by American biologists. He said he know little about the matter, and you are only right scientist who worked on this field, and he suggested to write to you. This is why I have to ask so many things related this eargent problem *to you.*

I knew well that so many things related with atomic bomb or energy is considered as a sort of military secrete, and the precious results you obtained might not be printed. However, if you have anything already published about this matter, I am very earnest to get a copy of it, if it is possible.

Explosion happened in 1st of March seems to me very different from that happened at Hiroshima and Nagasaki. The latter case the radiation is the cause to damage any sort of living including human being, but in the former the radio active ash is something as far as in the area pretty far from the spot. The ash itself was already analysed chemically by the chemists, and they told us calcium is the most and various kinds of bomb products are mixed in. The amount of ash the boat which located 15 sea miles East of prohibite area is merely few mm. thick on the deck. And, this is the only data we have for the calculation of the concentration of the radio acitivity in the sea water by that I have to enumerate the radio activity of various sort of fish which would be the food of tuna in that area about which the Japanese fishing industry has great concern, as well as the majority of the people in this country.

If you can answer me from your knowlege to the following question I will appreciate it very much.

- 1) Do you have any idea about the pattern of density distribution of this sort of ash both by wind and water current?
- 2) What concentration of radio activity of the sea water makes living fish in that water to have enough radio activity to let it be dangerous to eat?
- 3) What sort of circulation of the various radio active elements produced by the bomb can be expected in the food chain of the marine organisms in the area by the coral reef and in the area off at deep water, including tunas and sharks as the fish in the highest food rank?

We are hoping to make a miniature experiment in aquarium to solve a part of the question above mentioned, if it is allowed to do it, however we have no idea what concentration of the radio activity of the water should be prepared to put the fish in.

I am hoping your early reply about the matter, because I am earnest to blow out and take off some sort of anti-american feeling which probably originated by the communists ~~who~~ who are utilizing the chance of this unfortunate accident and aiming to let people fear their common food and get in confusion.

Yours truly,

P.S. The matter would be serious, so if you want to know my status please ask it to Dr. VanCleve.

