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Examining the Distribution of Radiation at the Bottom of Reservoirs

In Fukushima prefecture, there are approximately 3,700 reservoirs used for agricultural purposes. In order to enable efficient examination in detail of the amount of radioactive materials existing in these reservoirs, the Japan Atomic Energy Agency (JAEA) has been measuring radiation at the bottom of more than a dozen model reservoirs using various methods in efforts to prepare a standard manual for a monitoring method. The Farmland Management Division of Fukushima Prefecture Agriculture, Forestry and Fisheries Department, are planning to utilize these measurement results, together with its original studies, in measures against radioactive materials in reservoirs. The following is the radiation measurements of the bottoms of reservoirs performed in July in Fukushima prefecture.

After making a turn off of the prefectural road, roads became gradually narrower. The roads were unpaved after a certain point, and by going even further, the view opened up to present a reservoir surrounded by nature (**Photo 1**).

This was where the examination of the reservoir would be taking place over the course of several days. Although the sky seemed like it was ready to rain any minute, there was no troublesome wind eventuated, and as scheduled, operations began.

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Radiation measurements of the bottom of the reservoir with plastic scintillation fibers (PSF) were completed by the previous day, and on this day radiation measurements with the J-SubD (underwater gamma-ray spectrometer) (**Photo 2**) and the collection of soil samples from the same spots were to be performed.

First, the J-SubD was prepared. The J-SubD was developed last year as an underwater measuring device boasting high resolution. Lines of measurement were configured on the reservoir as a grid having intervals of 5m, and based on instructions given by the operation supervisor Shigeaki Yonezawa at the measurement origin using the Total Station (a measuring device capable of measuring distances, angles, etc.), from the boat set in position, the J-SubD was accurately lowered into the water.

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Yoshihide Takamura who had been in charge of developing PSF from the previous fiscal year was handling the detectors from the boat. Upon Takamura's call of "bottom reached!" Tsutomu Yamada, an expert of radiation detection systems such as the J-SubD, at the base setup onshore, reviewed the data that was sent in real time from the J-SubD through the cables. (**Photo 3**)

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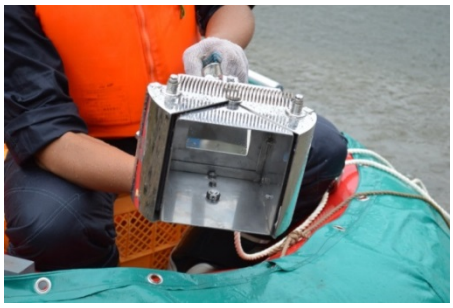
As the water level had dropped and the sunlight could reach underwater, algae and aquatic plants had grown and got tangled in the cables. On every occurrence, the staff in charge must manually resolve this situation. (**Photo 4**)

④

While occasionally being showered with heavy rain, the staff members each assumed their roles and continued with measurements moving from one point to the next. Yonezawa said, "Of course it is better to perform these measurements in fine weather, but the thought of the farmers who use these reservoirs compelled us to complete these studies as soon as possible."

Subsequently, a soil sample collecting device known as the Ekman-Verge Bottom Sampler was prepared. This device is a cube with each dimension being approximately 20cm. After it is placed onto the

bottom surface of the reservoir with its bottom flap open, the flap closes with a strong force to scrape the soil. (**Photo 5**)


⑤

However, the bottom of the reservoirs were not always sand or mud. Apart from aquatic plants, there were many locations where large rocks lay, and therefore soil samples could not be collected along every line of measurement. By determining points where the collection of samples was available, soil was able to be collected from several points. (**Photo 6**)

After completing the work, staff members entered their cars while still being drenched from rain. Steam generated by body heat and the resultant drenching from the rain instantly fogged up the car.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The soil samples would be analyzed at the Sasakino Analytical Laboratories in Fukushima City, and then further evaluated and analyzed along with the measured radiation data. All members shared the thought that the results from the measurements would be useful for farmers and the people of the region by acting as an indicator of the safety of the water and soil.

Plastic Scintillation Fibers (PSF)

This is a measuring device that uses optical fibers and is capable of measuring radiation along a line or of a two-dimensional expanse instead of at specific points. The maximum length of the detecting units (the optical fibers) is 20m. By moving the detectors parallel to the ground while maintaining a straight line, in addition to measurement of a two-dimensional expanse, measurement of curved lands is possible, and also, as the device is treated to be waterproof, underwater measurement is possible.

J-SubD (Underwater Gamma-Ray Spectrometer)

This is a radiation measuring device that has been newly developed exclusively for underwater applications and uses a LaBr scintillation detector for the detecting unit. The device has a water resistance which can withstand at a depth of 300m. Additionally, with its ability to measure the energy spectrum with a higher resolution than NaI scintillation detectors, it is capable of distinguishing radioactive cesium from other natural radionuclides.