SUMMARY OF OPERATIONS ON CONTRACT NO. W-28-094-eng-33

FOR THE MONTH OF APRIL 1948.

Project I.* Basic studies of the effect of X-rays upon fish in various stages of development.

Section I and II*

The young chinook salmon fingerlings (F_2 generation) produced from the 1947 spawning of adults from irradiated (100 r) and control stock continue to develop. Mortality records were kept on the loss experienced by the offspring of each female. Total cumulative mortalities as well as the periodic mortalities at various stages of development are being tested for statistical significance. These data together with a summary of the work in these sections will be reported on in an early report.

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Section XI a - XI b

The young fish in these sections are the second generation (F_2) offspring of the adult rainbow trout exposed to X-rays and spawned in 1945. As a part of the study program on these fish the entire lot were individually weighed and measured to provide data for continuing the study of growth in length and weight.

Some of the male fish in this group are sexually mature but no attempts were made to use their spawn for fertilization experiments because of a lack of females of the same age class with mature eggs.

Project V. Laboratory experiments using Bikini "mud" and coral rocks as sources of fission products are summarized.

* Project and section numbers refer to the Project Chronology Chart and Summary, UWFL-9, revised March 11, 1948.

From mid-February to the end of March the techniques of rearing a marine flat fish, Parophrys vetulis, in non-circulating salt water aquaria were studied.

Best results were obtained by placing one fish to an aquarium. The size of the fish ranged from 133-147 mm. The aquaria used were 8" x 11 3/4" x 8" and were set in a hatchery trough with running water for cooling. During April the temperature was 52 - 53°F. Air was bubbled through the water in each aquarium by means of a Marco air pump with a carborundum tip at the terminus of each air line. This was the only means of circulating the water. Water was not changed during April. Also added to each aquarium was sand, either one mussel (Mytilus edulis) or one clam (Macoma secta), one shoot of eel grass and one small bit of algae, Ulva sp.. Fresh minced clam was apparently a satisfactory food and was preferred to several others offered.

By the first of April it was believed that knowledge of caring for these animals was sufficient to conduct an experiment. Six aquaria as described above were available. In aquarium #2 the sand was replaced with active Bikini mud that had been ground in a particle grinder. It would have been well to have had a control aquarium for #2 with non-active Bikini mud ground to the same fineness but such was not available. This was not a food experiment but an experiment to observe the effect of the mud upon a fish. The fish was fed and cared for in the same manner as those in the other aquaria. Since flatfish are bottom dwellers and usually spend a great deal of their time burried in the bottom, always 50% and as much as 95% of the surface of the fish was in direct contact with the mud.

Counts of the Bikini mud uncorrected for self absorption and

geometry of the counter (about 15%) were approximately 10,000 per minute per gram. Readings on the Victoreen survey meter, Model 263, of the mud after it was placed in the aquaria, but before the water was replaced were as high as 12.5 on the 1 scale which is roughly translated to 8 r per day. Two days after the mud was added to the aquarium, April 3rd, some mud could still be seen in suspension in the water. A 5 ml. sample of water at that time gave a count of 5 per minute uncorrected for geometry (approximately 15%).

The flatfish placed in the Bikini mud aquarium on April 1st died on April 7th. Ashed samples of the gill, muscle, skin, bone, digestive tract gave no count above background. This fish fed the first three days but not the last four. The suspension of the fine mud particles in the water probably was a factor causing death. The dead fish was immediately replaced by one from the supply tank and has fed regularly since then to the present, (May 3rd). By April 10th the water in aquarium #2 was clear. This may be due in part to the fact that the clam placed in the aquarium at the same time as the fish died on April 9th. Clam samples of gill and digestive tract were ashed and counted. There was no count in the gill sample and about 5 counts per gram in the digestive tract sample which could have been due to particles of mud in the digestive tract rather than activity in the tissues. The clam was not replaced.

The alga, Ulva sp., commonly known as sea lettuce, that was placed in aquarium #2 on April 1st was removed and counted for activity on April 23rd. It was mostly covered with Bikini mud so was washed and rinsed several times to remove all mud particles. This was done by washing carefully by hand under running water.

Weight of sample was 0.35 gm. The count per minute per gram was approximately 68. To check the washing method for the purpose of determining if the above count or part of it was due to particles adhering to the alga a second sample was placed in the same aquaria and covered with Bikini mud for ten minutes. The sample was washed as above and counted. Sample weight was 0.38 gm. The count per minute per gram was approximately 19. This indicated that the washing method was inadequate. The alga was replaced on April 23rd. A count will be made later with a special effort to locate the source of activity.

Another experiment was started April 1st in aquariums #5 and #6. Some coral samples brought back from Bikini in 1947 were radioactive principally because of an oil scum adhering to the coral. Counts, uncorrected for geometry which was about 15%, of coral without the oil scum was about 3 per minute for a 2 gram sample. A similar size sample coated on one surface with oil scum had a count of 2800 per minute. Pieces of the coral with the oil scum were chipped off and used to pave the bottom of aquarium #5. A thin coating of sand was added but no more than enough than the fish would scatter as it rested on the bottom. Thus the oil scum was in contact with the underside of the fish at all times except when the fish was moving. The reading on the Victoreen survey meter placed in aquarium #5 before water was added was as high as 17 on the 1 scale which is roughly translated to 12 r per day. A 5 ml. sample of water on April 6th gave no count above background. The fish in this aquarium has fed regularly from beginning of experiment to the present (May 3rd). Aquarium #6 was set up as a control and duplicated #5 except that

the coral used was without the oil scum and had no count above background on the survey meter. The fish in #6 has likewise fed regularly.

Aquaria #1, 3 and 4 were retained as controls.

Six larger aquaria, 12" x 24" x 16", were set up originally but were not as satisfactory as the setup for the smaller aquaria described above. The large aquaria are now being used as supply tanks for fish and other marine animals as well as for an irradiation mortality experiment with the marine snail, Thais lamellosa.

On April 14th six more of the smaller aquaria were delivered and were set up in the same manner as those for the flatfish. Tide Pool johnnies, a sculpin, Oligocuttus maculosus, were placed in these aquaria. They have not yet been used experimentally but seem well adapted to their new environment.

The experiment in aquaria #2 and #5 will be continued until it is believed that the fish is about to die. At that time tissues will be preserved for histological studies.

Project VI. Observations on the amphipods were discontinued because of high mortalities among the controls. A report will be submitted.

Marine snails, Thais lamellosa, that had been surviving well in 15-gallon aerated aquaria, were individually marked with a number and X-rayed on April 2. Exposures given, and numbers of snails irradiated, were: 10,000 r - 2; 5000 r - 6; 2500 r - 9; 1250 r - 9; 500 r - 9; and 200 r - 9. After 3 weeks the mortalities among irradiated and control snails were approximately equal. The snails spawned in the aquaria, attaching their egg cases to rocks, shells, and especially to the glass sides of the aquaria. When only a few egg cases were deposited, their positions were recorded along with

the designation number of the parent snail in order to correlate hatching with X-ray dose. Further spawning filled in the spaces between egg masses rendering identification dubious. Difficulty is being encountered in providing sufficient aeration with the pump available. Weekly census of the snails is continuing.

During the month the Applied Fisheries Laboratory was visited by Dr. Simeon T. Cantrill, Swedish Hospital, Seattle, Washington.

Dr. L. R. Donaldson made a trip to Richland, Washington for conference April 27, 1948, with Dr. Shields Warren, Dr. Herbert Parker, Dr. S. Cantrill, Dr. Failla, Mr. C. Shugg, Mr. Shaw, Mr. R. Hageman, Mr. W. K. Crane, Mr. Lewis, and Mr. Harris; and to visit the laboratory in the 100-F area.

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