Collection of detergent samples with Mr. Stewart, from those brands in use at that time. With Dr. Cerame, conferred with Coast Guard officials, especially regarding the use of detergents. Begin bioassay experiments on fish, continuing through the night with the assistance of Drs. Cerame, Maddux and graduate assistants Mr. and Mrs. Herb Austin.

March 8.—Continuation of bioassay experiments. Survey of damage in Condado lagoon and Punta El Boqueron area. Advisory meeting with Department of Public Works.

March 9.—Return to Mayaguez to teach Ichthyology class.

March 10.—Return to San Juan. Continue bioassay experiments with assistance of graduate assistants John Rees, Manuel Hernández and Andrew Rehm.

March 11.—Conduct field test on the affect of leaching of oil from absorbants. Aerial reconnaisance with Dr. Graham Giese and Mr. Manuel Hernández. With advice and assistance of Drs. John Ziegel and Graham Giese, the leaching experiments were expanded to include the effect of the natural surf on the absorbants after saturation with oil.

March 12.—With the assistance of Mr. Jose Gonzalez, a survey of San Juan harbor was made to determine the extent of marine life damage. Water samples were collected at various stations. Assist Mr. Hamilton Ramirez (Dept. Public Works) during observation of field tests from RV Carite on the effectiveness of the absorbants Ekoperl and bagasse. Return to Mayaguez.

DETERGENT BIOASSAY STUDIES ON FISH

Considerations

Because of the immediate need for preliminary results on which to base intelligent counsel, these experiments were generally not conducted for more than 18 hours for any one test, except where indicated. All tests, except one (the 27 p.p.m. series) were conducted at the Dept. of Marine Sciences temporary mobile laboratory on Condado. The 27 p.p.m. (parts per million) series was conducted at the Dept. of Marine Sciences laboratory at La Parguera using identical species of fish.

The fish used were all collected from the Condado Lagoon except those of *Abudefduf saxatilis* which were collected near Boca de Cangrejos. The sea water used in these experiments was collected at Boca de Cangrejos, where it was thought to be relatively free of contamination from oil or detergents. The temperature during the experiments ranged from 71–79° F. Control mortalities ranged from 0% to not more than 15% for the exposure times indicated in the table.

Results

Reference to the table indicates that all the detergents tested expressed toxicity. The toxicity is expressed in terms of percent mortality and percent loss of balance for various concentrations over exposure periods of at least 6, 12 and 18 hours. During the testing, observations were made as to abnormal behavior, change in respiration rate (ventilation), and ability to recover after exposure. Loss of balance is considered when fish no longer can right themselves due to the effect of the detergent. All detergents showed toxic affects on the fish at the lowest concentrations tested. Where death or loss of balance did not occur, there was observed varying degrees of stress apparently caused by the detergents. In some cases there was noted a species-dependent sensitivity.

Conclusions

1. These bioassay tests were, in effect, attempting to determine the toxicity on adult fish after limited periods of exposure to detergents. The adult stage does not represent the most sensitive or critical period of the fishes life cycle. Knowledge is badly needed regarding the long-term effect on all stages of the life cycle before we can intelligently determine the potential damage caused by adding foreign matter to the environment.

In order to eliminate experimental variables caused by keeping animals in captivity in the laboratory, routine bioassays are usually run for a period of 48 to 96 hours. This is thought to be a minimum standard to estimate toxicity and to also provide a better standard for comparison of results.