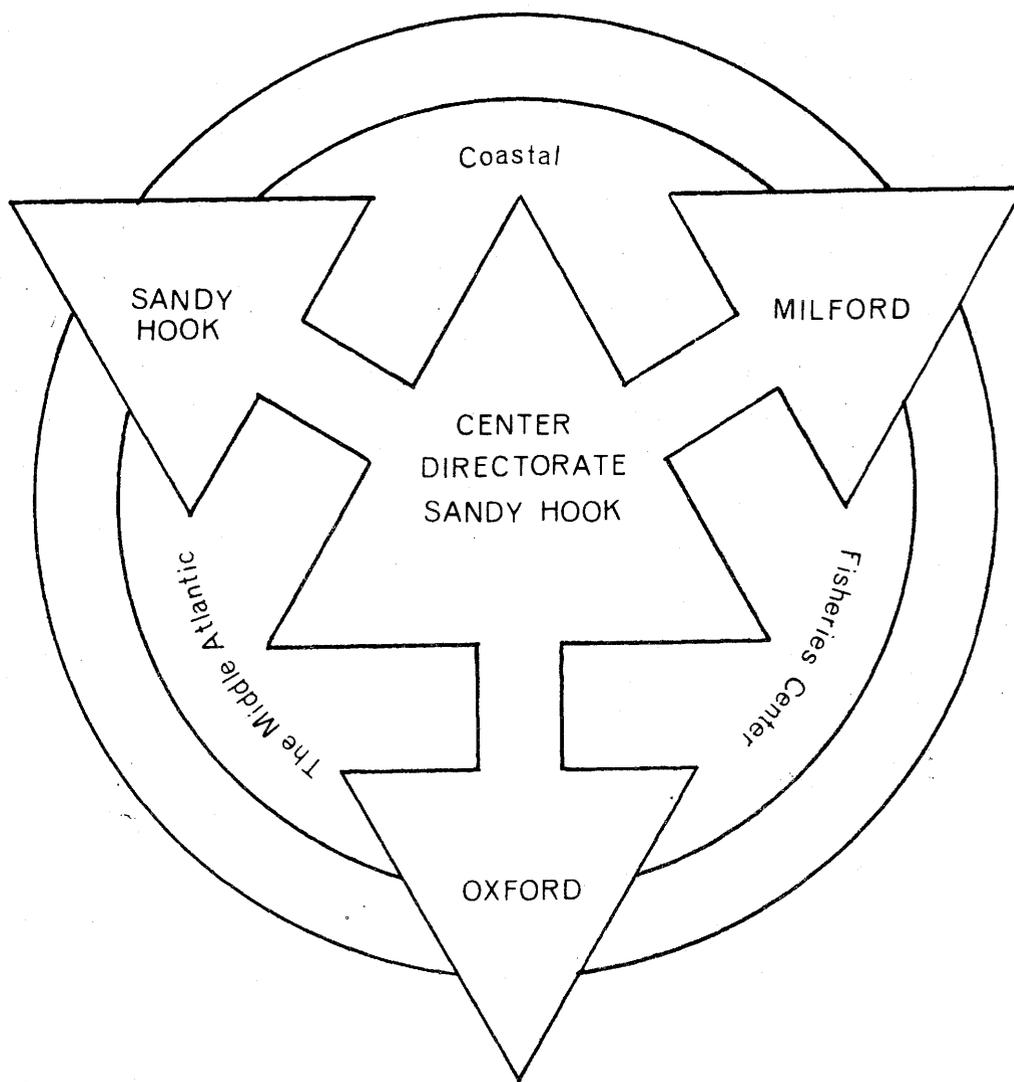


DRAFT RESEARCH PROPOSAL FOR FY 1976
MESA-NYB FUNDING: "ENVIRONMENTALLY-INDUCED
MUTAGENESIS IN MARINE FISH"



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



Informal Report No. 53

March 26, 1975

DRAFT

Research Proposal

Submitted by

Middle Atlantic Coastal Fisheries Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

to

MESA-New York Bight Project Manager
Marine Ecosystems Analysis Program
Environmental Research Laboratories
National Oceanic and Atmospheric Administration

for support of studies on:

ENVIRONMENTALLY-INDUCED MUTAGENESIS IN MARINE FISH

Total Amount Requested: \$171,600.00

Date: _____

Approved by: _____

Principal Investigator
(203)-878-2459

Carl J. Sindermann
Director, Middle Atlantic Coastal Fisheries Center

ENVIRONMENTALLY-INDUCED MUTAGENESIS IN MARINE FISH
(Narrative summary of proposed research)

Some marine contaminants such as heavy metals and certain pesticides may be mutagenic. Recent work at the Milford laboratory of the Middle Atlantic Coastal Fisheries Center has shown that silver and cadmium have chromosome breaking and general radiomimetic effects on the chromosomes and cell division apparatus of the oyster. This was true with both chronic and acute exposures. Damage was still detectable at doses well below those which fail to have a lethal effect on the first-stage larvae. Though only limited work has been done, it appears, on the basis of radiation research, that fish eggs are several orders more genetically sensitive than are eggs of invertebrates. Eggs of fish probably approach mammalian eggs in such sensitivity. Dominant lethal mutations induced in naked, unprotected pelagic fish eggs completing critical early cleavage divisions in a polluted environment could affect any spawning season's recruitment into the fisheries. Rarely could such eggs survive through the larval stages. Semi-dormant lethals could reduce vigor of the adult. Dominant lethal mutations are known to be accompanied by gross chromosome aberrations. Radiation and chemicals which break chromosomes very often induce a whole series of less specific effects on the chromosome apparatus of the dividing cells which lead to genetic disarray at the cellular level. In turn, simple cyto-toxic chemicals can cause disorderly distribution (and breakage too) of chromosomes, with genetic imbalance - often lethal - the result.

Working with fish eggs provided by the May 1974 Westward cruise, procedures were elaborated for studying the chromosomes and mitoses of fish embryos and early stage larvae from neuston and bongo net samples. Limited analysis of five sample stations in the New York Bight has shown that cyto-genetic abnormalities, similar to those that can be experimentally induced by recognized mutagens, do occur in eggs collected in the New York Bight. Furthermore, they occur at a very significant level. There is station variation. The full significance of this work to the fisheries, and its meaning in terms of the state of the marine environment can be determined only by further work. It seems that never before have the chromosomes and division apparatus been observed in blastodiscs of fish eggs directly out of the neuston. The Russian radio-ecologist Polikarpov has expounded on the importance of studies on the hyponeuston. However, his school, the only other one engaged in mutation studies on fish eggs, has used only experimentally spawned radio-nuclide-treated eggs.

It is proposed that additional samples of fish eggs from the polluted waters of the apex of the New York Bight be studied cyto-genetically for chromosome aberrations, radiomimetic, and cyto-toxic effects. Controls should be samples from relatively clean waters. Insofar as possible they should be from populations regarded as having matured in relatively unpolluted waters.

Field data would be augmented by experimental chronic exposure of fish, as well as by exposures of their experimentally spawned eggs, to known mutagens, and to one or a few marine contaminants most likely to be mutagenic factors in the New York Bight. Portions of the same induced spawning of some selected laboratory-held fish species would further be allowed to develop in "clean" water and in some limited samples of polluted waters from the Bight.

DRAFT

Work Unit: Title: Environmentally-Induced Mutagenesis in Marine Fish

BUDGET SUMMARY - FY 1976

	<u>% Time</u>	<u>MAN-MONTHS</u>	<u>MESA FUNDS</u>
<u>Personnel Service</u> (15% Benefits - Leave Surcharge, etc.)			
<u>Name or Position</u>			
Dr. James Hanks, Dir. of Invest. GS-15	10	1.2	4.1
*Dr. K. McNulty, Fish. Biol. GS-14	5	.6	1.6
Dr. A. Longwell, Res. Geneticist GS-13	50	6.0	13.8
Geneticist GS-11	50	6.0	8.9
(4) Student Trainees, Bio. Sci. Bio. Aids GS- 4	100	48.0	35.6
Overtime		<u>2.5</u>	<u>3.5</u>
		64.3	<u>67.5</u>
<u>Travel</u>			2.0
<u>Transportation of Things</u>			.3
<u>Printing and Reproduction</u>			.6
<u>Computer</u>			1.2
<u>Contracts</u>			1.5
<u>Support Services</u>			.5
<u>Capital Equipment</u> Photomicroscope			30.0
<u>Supplies and Expendables</u>			<u>25.1</u>
<u>Total Direct Funds</u>			128.7
<u>Total Support Funds</u>			<u>42.9</u>
Total Funds			171.6

* MESA Coordinator