

DDT, DDE and PCBs in the Tissues of Reef Dwelling Groupers (Serranidae) in the Gulf of Mexico and the Grand Bahamas

by

C. S. GIAM^{1, 2}, R. L. RICHARDSON², D. TAYLOR³, and M. K. WONG⁴

*Texas A&M University
College Station, Tex. 77843*

Introduction

In our baseline study (sponsored by International Decade of Ocean Exploration of the National Science Foundation) on the concentration of chlorinated hydrocarbons in biota from the Gulf of Mexico and Northern Caribbean (1971-1972), a variety of specimens were collected from many locations and analyzed. We also focused our investigations on groups of organisms such as zooplankton (GIAM, et. al. (1973)) and groupers (Serranidae). The logic for devoting special attention to the levels of chlorinated hydrocarbons in the tissues of groupers is based upon a preconception that organisms which spend their entire post larval life in one locality will yield data most representative of that particular area. Consequently, the information gained should not be biased by the sampling of organisms which have migrated in from some distance.

The Gulf of Mexico and Caribbean system have a number of coral reef areas distributed from 2-120 miles off its surrounding land masses. Stations from these areas were chosen (Fig. 1) in this preliminary survey so that a general pattern of the distribution of chlorinated hydrocarbons in the Gulf of Mexico might be obtained.

A coral reef system represents one of the most stable and productive ecosystems in the world. Temperature, salinity, and other physical fluctuations are minimal in a relatively constant environment. In addition, groupers of the genera Epinephelus and Mycteroperca have been found to maintain residence for extended periods on western Atlantic reefs (BARDOCH, 1958a; RANDALL, 1961, 1962, 1963; SPRINGER and MCERLEAN, 1962; MOE, 1966, 1967, 1969). Within the size range dealt with in this study (222-514 mm standard length),

¹To whom all inquiries should be sent

²Department of Chemistry

³Present address: Marine Biomedical Institute, University of Texas Medical Branch, Galveston, Texas 77550

⁴Present address: Department of Chemistry, Nanyang University, Singapore

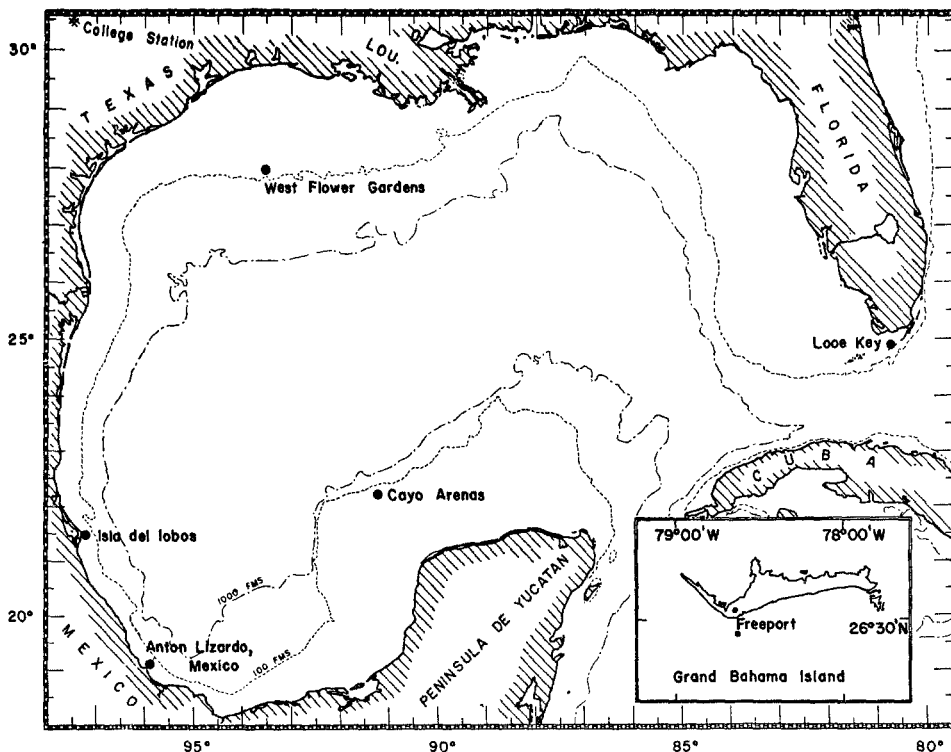


FIGURE 1
Sampling Sites

they are known to migrate only to a very limited extent (BARDOCH, 1958b; MOE, 1966, 1967, 1969). Furthermore, groupers are generally near the top level of the food chain, thus may be a culminating point for pollutants.

Methods

The groupers were collected by spearfishing utilizing SCUBA. All the specimens were immediately wrapped in aluminum foil and frozen. Specimens were later dissected for specific samples and transferred frozen to glass jars with metal caps lined with foil. The jars and foil were prewashed with nanograde alcohol. Lengths and weights were recorded from each specimen. Dissected tissue samples were then analyzed using methods described in a previous publication. (GIAM, et. al. (1973))

Results & Discussion

Results of the analyses are presented in Table 1.

From the results, it is seen that the levels of pollutants are generally low with little possible danger existing in regard to human consumption. Several locations, e. g. Flower Gardens and Anton Lizardo, Mexico, have slightly higher levels of pollutants which can

Table 1. Chlorinated Hydrocarbons in Muscle Tissues of Groupers
(ug per kg wet weight)

Station Position	Sample Ident.	Wt. (lbs.)	Standard length (mm)	P, P' DDE	P, P' DDT	DDT Total	PCB (As A-1260)
Anton Lizardo, Mex. 19° 32.5' 95° 55.3'	<i>Epinephelus striatus</i> " " " "	3.1 2.9 1.9 1.9 0.7	398 378 306 287 222	63 16 7 5 3	37 11 7 2 2	100 27 14 7 5	110 32 14 14 12
Loce Key (Florida Key) 24° 32.8' 81° 24.4'	" " "	4.9 4.8 2.8	414 416 338	3.4 3.4 2.4	- 3.3 2.9	3 7 6	33 12 10
Isla Lobos, Mex. 21° 27.3' 97° 13.6'	" " "	10.0 3.7 2.9	514 403 354	10.5 5.1 5.4	2.0 1.4 0.5	12 7 6	7 7 6
Grand Bahamas 26° 29.5' 78° 38.2'	" " " <i>Mycteroperca tigris</i> "	6.0 4.8 1.6 3.0 2.4	495 459 315 385 339	1.5 1.0 1.8 3.4 2.9	<0.2 - 0.2 1.6 2.6	2 1 2 5 6	5 3 3 14 .6
Cayo Arenas, Mex. 22° 07' 91° 23'	<i>Mycteroperca venenosa</i>	3.3	352	-	-	-	81
Flower Gardens Reef 27° 52.5' 93° 48.3'	<i>Mycteroperca interstitialis</i>	18.0	681	74	65	139	220

probably be attributed to the relatively poor circulation in the western Gulf.

At locations where pollutant levels are low, e. g. Grand Bahamas, a size versus concentration of pollutants relationship cannot be accurately observed. However, at Anton Lizardo, where the concentration of chlorinated hydrocarbons is about an order of magnitude higher than in the samples from Grand Bahamas, the levels of pollutants in the groupers increase with increasing size. This relationship is to be expected as the fat content increases with increasing size and age of the specimen.

Our preliminary results are limited to the analyses of muscle tissue and to a few stations. Further studies will concentrate on the analyses of brain, reproductive organs, and liver from a larger number of groupers, with emphasis on relationships between pollutant concentrations and size, age, feeding habits, growth rates, etc. As a result, the final study will yield a more complete picture of the distribution of chlorinated hydrocarbons in the Gulf of Mexico.

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