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LABORATORY EXPERIMENTS EXPOSING DOVER SOLE TO CONTAMINATED SEDIMENTS

A number of factors associated with the bottom sediments of the Palos Verdes region have been suggested as possible causative agents in the fin erosion disease of Dover sole and several other demersal species. These include differences in sediment grain size and roughness, external exposure to trace metals and pesticides, reduced pH, presence of hydrogen sulfide and/or absence of oxygen, and pesticide bioaccumulation. To determine if the fins of healthy Dover sole are directly damaged by contact with contaminated bottom sediments, we exposed Dover sole from Santa Catalina Island and Dana Point that had been maintained in the lab-oratory for periods of up to 1 year to a sample of sediment taken from the most highly contaminated region of the Palos Verdes shelf.

Test sediments Cup to 10 cm deep) were maintained in recirculating 40-gallon aquaria at 12°C for 3 weeks prior to the addition of fish. Initial checks of the sediments, which were made within 1 week after they were collected, revealed high levels of trace metals, volatile solids, chemical oxygen demand, and pesticides (Table 1). (Laboratory studies conducted by the Project to look at decomposition of contaminated sediments have shown that pesticides were lost slowly under conditions similar to those in this test.) Following the addition of fish, water quality was measured twice weekly; parameters checked were ammonia-nitrogen, nitrite, nitrate, dissolved oxygen, temperature, pH, and specific gravity. For the test, three Dover sole were added to each of four aquaria; two of the aquaria contained Palos Verdes sediments, and two contained silica sand. The fish were fed Tetramin staple tablet food.

In diseased specimens collected in the field, the middle portions of the dorsal and anal fins are the most severely affected. These are the portions of the fins used for sup-port during feeding and before swimming. At the end of 2-1/3 months of exposure to contaminated sediments in the laboratory, no signs of fin erosion were evident in any of the test fish; white tips were still visible on the distal ends of the dorsal and anal fin rays, and no deposition of melanin on the fin edges was apparent. The fact that sediment particles were seen to cling to the blind side of the test fish when they left the bottom suggests that they were producing mucus. The general behavior of the exposed fish was similar to that of the controls, and both groups were feeding well.

This experiment, which is still in progress, tests at least two of the possible causative agents associated with contaminated Palos Verdes sediments—grain size and rough-ness and external exposure to pesticides and trace metals. As the test sediment is continuously disturbed by the fish, the degree to which it can become anaerobic is substantially reduced. As a result, the actual exposure of the fish to an environment with reduced pH, a lack of oxygen, or the presence of hydrogen sulfide is also reduced in this test.

Future studies will involve further direct testing of possible causative agents under conditions simulating those seen in the field.

Table 1. Characteristics (mg/dry kg) of the Palos Verdes sediments used in laboratory exposure tests. These sediments were collected 6 Feb 1975 from an area where often over 50% of the Dover sole trawled have the fin erosion disease.

	Samples From Two Aquaria			
	Surface Scoop	Core	Surface Scoop	Core
Total DDT	109.8	136.0	99.6	168.3
Total PCB	0.181	0.185	0.204	0.262
Chromium	870		903	
Cadmium	45		49	
Copper	490		455	
Nickel	68		68	
Lead	331		331	
Zinc	1,680		1,430	
COD*	235,000		226,000	
Percent volatile solids*	17.9		17.3	

*Corrected for salt