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SAMPLING DISEASED FISH POPULATIONS

Anomalies of several types are present in southern California trawl-caught benthic fishes. The Project's past work has shown the Dover sole (*Microstomus pacificus*) to be the species most frequently affected by external anomalies; the anomalies most often seen are fin erosion and skin tumors. In the past year, we have continued to study these anomalies in the field, we have examined museum collections, and we have attempted to determine the amount of sampling required to adequately assess the prevalence of diseases in wild fish populations.

Data from 164 trawl catches taken in 1974 between Santa Monica Bay and Dana Point (including Santa Catalina and San Clemente Islands) yielded results similar to those from past surveys (Table 1). Prevalence of the fin erosion disease was highest in the Dover sole, rex sole (*Glyptocephalus zachirus*), greenblotched rockfish (*Sebastes rosennlatti*), and vermilion rockfish (*Sebastes miniatus*). Fin erosion was reported in 11 species; tumors or growths in 5 species; and ambicoloration in 6 flatfish species.

A new survey of eight stations in the vicinity of the San Diego City outfall off Point Loma on 12 February 1975 revealed that of 64 Dover sole collected, none had tumors or eroded fins.

Dover sole with fin erosion continued to be most prevalent off the Palos Verdes Peninsula (Table 2). Although there appears to have been a decrease in the percentage of affected individuals from 1972 to 1974 in the winter catches, this pattern is not evident in the summer catches (Figure 1). The resulting decrease in the variation between summer and winter catches might be a function of the condition of the Dover sole participating in the seasonal onshore/offshore migrations. Continued monitoring and comparison with changes in the characteristics of the contaminated Palos Verdes sediments should provide insight into the factors governing the occurrence of affected individuals.

Dover sole with eroded fins first appeared in significant numbers near the Orange County outfall system in May 1972 at the deep-water stations. This was approximately 13 months after a change in the depth of discharge from 20 to 60 m. Since August 1972, both the number and percentage of Dover sole with fin erosion in this area have declined (Fig-ure 2) and it appears that the affected fish in the area may be increasing in size. These observations, in conjunction with prevalence and size information, suggest that the diseased Dover sole found at this site could have come from the Palos Verdes shelf and that the greatest influx occurred in 1972.

Tumor-bearing Dover sole have been collected in areas other than southern California. To extend the geographical range of our observations, we examined collections of Dover sole at the Los Angeles Museum of Natural History and at Scripps Institution of Oceanography. Tumor-bearing Dover sole were present in catches taken as early as 1946 and were collected from locations both to the north and to the south of the Southern California Bight (Figure 3). The most southerly collection (off Cedros Island in Baja California on 25 November 1961: SIO 62-92-64) extends the known range of tumor-bearing Dover sole approximately 680 km co the south of the previously reported occurrence in Dana Point (Mearns and Sherwood 1974).

The prevalence of tumor-bearing Dover sole in southern California is low compared to the levels reported in affected populations of other species along the Pacific coast. Because of this low prevalence, the restricted size range of the individuals most frequently affected, and the seasonal variations in the appearance of the disease, it is difficult to detect geographical patterns.

However, by com-piling data collected over the past few years, we found that the prevalence of tumor-bearing Dover sole, 60-120 mm SL, seems to be greater in the combined samples from Santa Monica Bay, Palos Verdes, and San Pedro Bay (outfall areas) than in the combined control areas of Dana Point and Catalina Island (Table 3). However, because of annual variations, this trend cannot be verified unless sufficient numbers of fish Cat least 50 individuals, 60 to 120 mm SL, per area) are collected in control and test areas in a synoptic sampling. As disease prevalences in Santa Monica Bay and San Pedro Bay (but not off Palos Verdes) are higher in the fall and winter months, surveys for the purpose of establishing geographical differences should be conducted at the end of the year.

The recent data are consistent with the hypothesis that the fin erosion disease in the Dover sole and several other species is associated with municipal wastewater discharge off the Palos Verdes Peninsula and would be affected by changes in discharge practices or sediment quality. In addition, new information on the distribution of tumor-bearing Dover role supports earlier conclusions that this disease is a widespread phenomenon, characteristic of juvenile populations.

This work is being summarized as part of a task report to be submitted to the Environmental Protection Agency.

REFERENCE

Mearns, A. J., and M. J. Sherwood. 1974. Environmental aspects of fin erosion and tumors in southern California Dover sole. Trans. Amer. Fish. Soc., 103:799-810.

Table 1. Three categories of anomalies in fishes collected in 164 trawl samples from Santa Monica Bay to Dana Point, including Santa Catalina and San Clemente Islands, 1974.

Species		Number With Anomaly	Total Number
Fin Erosion			
Microstomus pacificus	Dover sole	1,141	4,815
Glyptocephalus zachirus	Rex sole	73	611
Genyonemus lineatus	White croaker	19	2,340
Sebastes rosenblatti	Greenblotched rockfish	9	36
Lyopsetta exilis	Slender sole	5	845
Sebastes miniatus	Vermilion rockfish	4	56
Sebastolobus alascanus	Shortspine thornyhead	2	11
Anoplopoma fimbria	Sablefish	2	231
Chilara taylori	Spotted cusk-eel	1	97
Sebastes elongatus	Greenstriped rockfish	1	38
Sebastes jordani	Shortbelly rockfish	1	981
Tumors or Growths			
Microstomus pacificus	Dover sole	25	4,815
Genyonemus lineatus	White croaker	8	2,340
Sebastes eos	Pink rockfish	1	1
Sebastes jordani	Shortbelly rockfish	1	981
Zaniolepis frenata	Shortspine combfish	1	186
Ambicoloration			
Pleuronichthys decurrens	Curlfin sole	9	253
Symphurus atricauda	California tonguefish	7	1,036
Pleuronichthys verticalis	Hornyhead turbot	4	513
Microstomus pacificus	Dover sole	3	4,815
Parophrys vetulus	English sole	2	464
Hippoglossina stomata	Bigmouth sole	1	187

Table 2. Prevalence of fin erosion in Dover sole collected off southern California, 1972-75.

	Santa Monica Bay	Palos Verdes Shelf	San Pedro Bay	Dana Point	Point Loma	Santa Catalina Island
No. of Samples	60	144	73	78	8	28
No. of Samples with Dover sole	39	106	44	45	7	16
Sampling Period	1972-73	1972-73	1972-73	1972-74	1975	1972-74
No. of Dover sole	516	14,277	3,842	881	64	135
No. with eroded fins	9	5,594	88	6	0	0
Percent with eroded fins	1.7	39	2.3	0.68	0	0

Table 3. Southern California tumor-bearing Dover sole collected in fall and winter catches (August through January), 1972- 74.

	Santa Monica Bay	Palos Verdes Shelf	San Pedro Bay	Dana Point	Santa Catalina Island
No. Dover sole <60 mm SL	0	6	14	7	0
No. with tumors	-	0	0	0	-
Percent with tumors	-	-	-	-	-
No. Dover sole 60 – 120 mm SL	44	1,372	214	21	16
No. with tumors	4	70	19	0	0
Percent with tumors	9.1%	5.1%	8.9%	-	-
No. Dover sole >120 mm SL	200	3,793	1,530	400	30
No. with tumors	1	15	5	0	0
Percent with tumors	0.50%	0.40%	0.33%	-	-

Figure 1. Dover sole collected at nine stations off the Palos Verdes Peninsula, 1972 – 1974.

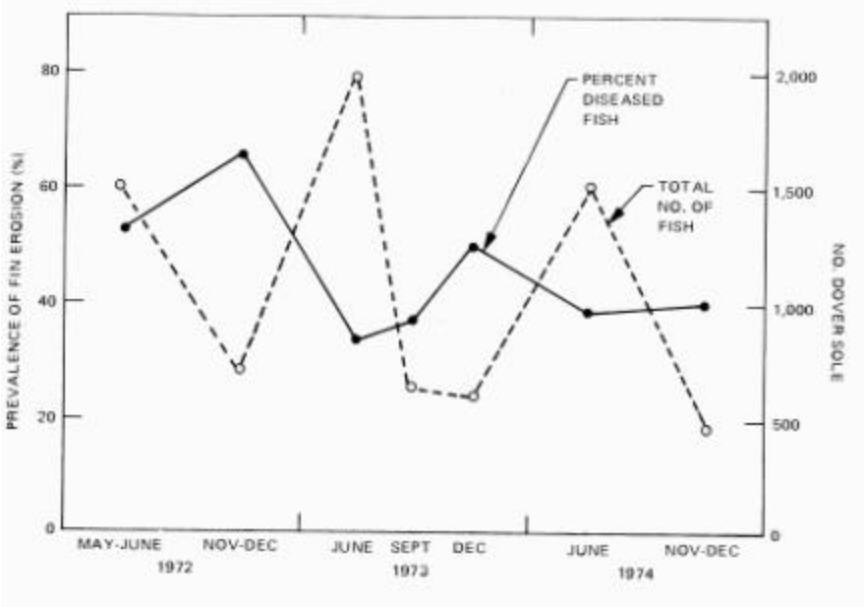

Figure 2. Number of Dover sole with fin erosion collected at eight stations off Orange County (August 1974; sampling at seven stations, two of which were sampled in earlier surveys).

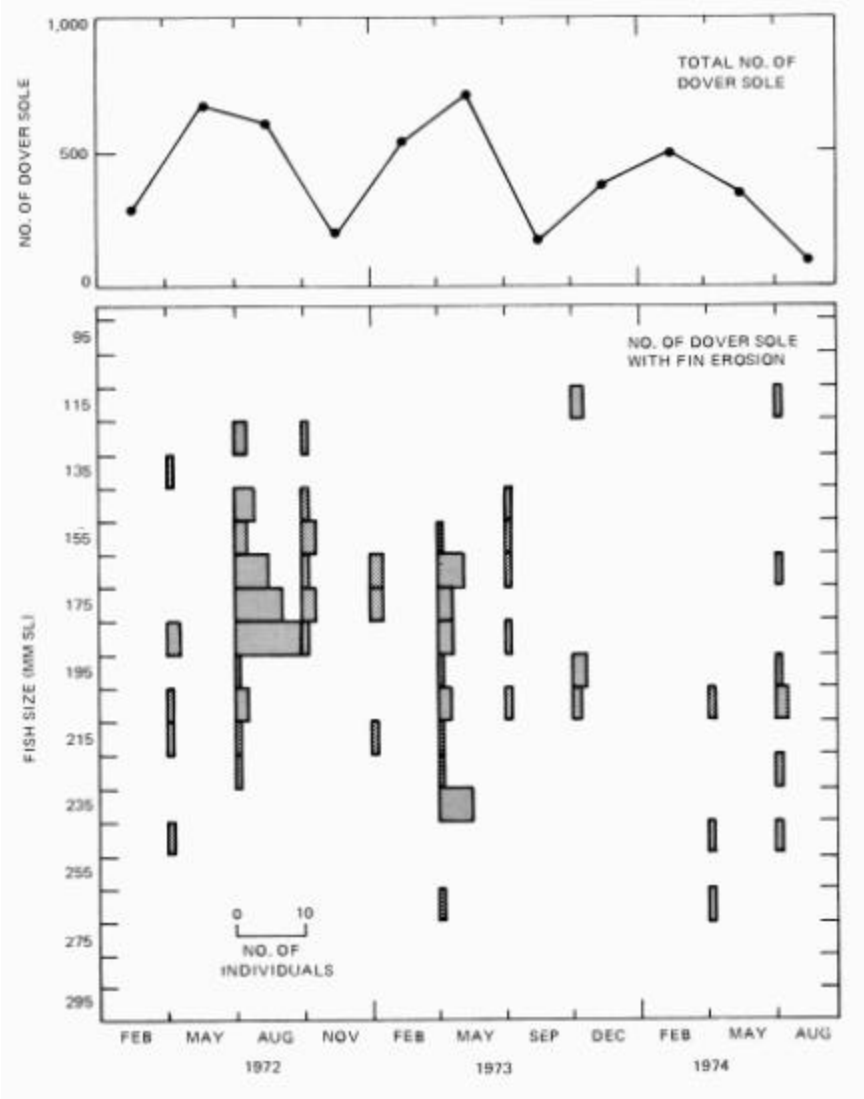

Figure 3. Location at which Dover sole with skin tumors have been collected.