1969

Treatment of shell with Polystream to increase survival of oysters (Crassostrea virginica) in Virginia

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TREATMENT OF SHELL WITH POLYSTREAM TO INCREASE SURVIVAL OF OYSTERS (*Crassostrea virginica*) IN VIRGINIA

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SPECIAL SCIENTIFIC REPORT NO. 54

W. J. Hargis, Jr.
Director

March 1969

ABSTRACT

Survival of oysters set on shells treated with Polystream* was investigated during 1963 and 1964. Treated and control shells were held in wire bags in the high-salinity intertidal seaside area of the Eastern Shore and in the moderate-salinity subtidal areas of the lower James River. Significantly more spat survived on treated shells than on controls. Differences in survival could not be attributed to absence of drill predation on treated shell.

INTRODUCTION

A mixture of chlorinated benzenes known as Polystream and other compounds have been used in conjunction with culture of the oyster Crassostrea virginica to kill or repel the oyster drill predator Urosalpinx cinerea. In a series of studies in Long Island Sound, oyster bottoms were treated with Polystream and the carbamate Sevin mixed with sand. This mixture has been reported to control predation by oyster drills (Loosanoff, 1961a). During later studies in Maryland and Virginia, similar techniques failed to control drill predation (Shaw and Griffith, 1967; Haven et al., 1966).

Shells treated with Polystream and then placed in a setting area frequently had more oyster spat surviving at the end of a growing

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* Registered trademark.

period than had untreated controls (Loosanoff, 1961b; Shaw and Griffith, 1967; Castagna et al., in press; Andrews, personal communication). The present program was designed to evaluate statistically effects of Polystream treatment of oyster shells on survival of spat.

The authors wish to thank the H. M. Terry Oyster Company of Willis Wharf which generously donated shells and use of their oyster grounds for these studies. We wish to thank the Hooker Chemical Company, Haddonfield, New Jersey, for donating Polystream.

DESCRIPTION OF AREAS AND METHODS

The first study was conducted in 1963 on the Eastern Shore of Virginia where seed oysters are commercially grown. Forty galvanized wire bags were each filled with about 1/5 bushel of clean oyster shells. On 12 June 1963, 10 bags were dipped for one minute in Polystream and 24 hours later placed on a seed rock in the Machipongo River. Ten untreated bags were placed 150 feet away as controls. On 19 June, 10 additional bags were dipped in the chemical for one minute and 12 hours later placed on a seed rock at Tug Ames; 10 control bags were placed 150 feet away. At both locations the bottom ebbed dry and consisted of a layer of firm shell. Previous surveys showed that oyster drills Urosalpinx cinerea follyensis were moderately abundant at Tug Ames but extremely scarce at the station in the Machipongo River. Salinity at Tug Ames varied from 32 to 35 ppt; at Machipongo River it varied from 25 to 34 ppt.

On 1 October 1963, all shellbags were removed and transported to the laboratory. Fifty shells from each bag were examined and numbers

of spat, spat scars, and drilled spat on each shell were recorded. Length of all spat on 10 shells from each bag was recorded. Mean spat per shell, mean number of drilled spat, mean number of spat scars, and mean length of spat were calculated. Results were compared using Student's "t" test.

Similar studies were conducted at Brown Shoal and Hampton Flats in the lower James River in 1964. Forty galvanized wire bags were filled with shell as previously outlined. Twenty bags were dipped in Polystream for two minutes; the remaining bags were not treated. Three hours after treatment on 27 July, all bags were placed on a hard, shelly bottom at Brown Shoal. Depth was about 2 m at mean low water and salinity varied from 12 to 18 ppt during the study. The oyster drill U. cinerea was present at Brown Shoal, but previous studies indicated that predation by this animal would be light (unpublished data). To introduce significant predation into the test, 10 treated and 10 control bags were raised from the bottom and transferred on 29 September eight miles downriver to Hampton Flats where drill damage to small oysters was known to be intensive. Examination of two bags on the transfer date established approximate number of oysters per shell on test and control groups. On 27 October 1964, all shellbags at both locations were removed and 50 shells from each bag were examined for number of spat, drilled spat, spat scars and length. Data were statistically evaluated as previously outlined.

RESULTS

At Tug Ames and Machipongo River, all groups received a light set of small oysters, with mean counts ranging from about four to six spat

per shell. At Tug Ames, treated shells had 1.31 times more spat than the control; similar results were obtained at Machipongo River (Table 1). Differences between treated and control shells were statistically significant at the 95% confidence level. There was essentially no drill activity at Machipongo River, but drills were destroying small oysters at Tug Ames, as evidenced by the occurrence of drilled spat. At this latter location, treatment apparently did not significantly reduce drill predation; both test and control groups had similar numbers of drilled spat. There was no significant difference for mean spat length between test and control groups. Mean number of spat scars was significantly higher at Machipongo River but no differences were found at Tug Ames.

In the lower James River, results were similar to those obtained on the Eastern Shore. Treated bags placed at Brown Shoal on 27 July and allowed to remain there until the end of the study had 1.63 times more surviving spat than the controls (Table 2). There was light drill activity but there was no difference between treated and control shells for number of drilled spat, spat scars, or mean spat length.

Treated and control shellbags transferred from Brown Shoal to Hampton Flats had, on the transfer date, approximately three to five spat per shell. However, statistical parameters were not determined. After 29 days at Hampton Flats, treated shells had only slightly lower mean number of spat than shells which had spent the entire period at Brown Shoal. There was a greater reduction in number of spat on the control shells. Consequently, treated shells had 3.63 times more spat than the controls. Drills had been actively feeding on

oysters in both groups. However, there was no evidence of a significant difference in number of drilled spat, spat scars, or length of spat between treated and control shells.

SUMMARY AND CONCLUSIONS

Polystream treatment of shells resulted in significantly more oysters on treated shells than on controls at the end of the exposure period. The treatment appeared to be equally effective in the high-salinity intertidal Eastern Shore area as it was in the moderate-salinity subtidal location in the lower James River. Increased survival associated with treatment ranged from 1.2 to 3.6 times more spat on treated shells than on controls.

The present studies agree with results obgained by Shaw and Griffith (1967) and Castagna et al. (in press). These authors, working in Chincoteague Bay on the Eastern Shore and in the Maryland and Virginia portions of Chesapeake Bay, also showed heavier survival of set on treated shells. No difference was observed in either study in size of spat on treated and control shells.

The manner in which Polystream acts to bring about increased numbers of oysters on treated shells is not clear. At the end of the study in the drill-infested areas of Tug Ames and Hampton Flats, more oysters were on test shells than on controls. However, differences in drill predation were not suggested since both groups had similar numbers of drilled spat and spat scars. There is the possibility that Polystream may repel or kill predators other than oyster drills.

This is indicated by the higher number of oysters on treated shells over controls at Machipongo River where drill damage was almost zero.

Polystream is presently used in conjunction with shellfish culture in a few areas of Connecticut and New York. In these states it is mixed with sand and applied to the bottom of oyster-growing areas to kill or repel the oyster drill. Application is by permit only which is issued by state or federal agencies, and various laws regulate its use. In Virginia the use of Polystream has not been approved. Consequently, future use must depend on its approval by the appropriate state agency.

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Table 1

Effects of treatment with Polystream of shells held in bags, Eastern Shore, Virginia, June to October 1963

	Tug Ames		Machipongo River	
	T	C	T	C
Number shells	400	400	500	450
$\bar{x}$ number spat/shell	5.40* (1.92)	4.13 (1.83)	5.96* (1.39)	4.56 (1.61)
$\bar{x}$ drilled spat/shell	0.46 (0.69)	0.59 (0.67)	0	0[t]
$\bar{x}$ spat scars/shell	0.51 (0.47)	0.72 (0.53)	0.58* (0.37)	0.21 (0.24)
$\bar{x}$ length spat, mm	19.9	18.0	17.1	16.4

* Significant difference, 95% confidence level.

t One drilled spat.

( ) Standard deviation.

Table 2

Effect of treatment with Polystream of shells held in bags in lower James River, Virginia, 1964. All bags initially placed at Brown Shoal, 27 July. One-half transferred to Hampton Flats on 29 September; all removed on 27 October.

	Brown Shoal		Hampton Flats Transfers	
	T	C	T	C
Number shells	450	500	500	450
$\bar{x}$ number spat/shell	4.98* (0.34)	3.05[t] (0.36)	3.87* (1.12)	1.07[t] (0.61)
$\bar{x}$ drilled spat/shell	0.06 (0.11)	0.03 (0.07)	0.28 (0.27)	0.33 (0.25)
$\bar{x}$ spat scars/shell	0.23 (0.23)	0.17 (0.14)	0.47 (0.46)	0.36 (0.22)
$\bar{x}$ length spat, mm	8.49	8.34	7.23	7.12

* Significantly higher than control, 95% confidence level.

t Hampton Flats had significantly less than Brown Shoal.

( ) Standard deviation.