A COMPARATIVE STUDY: FOULING OF VINYL AND GALVANIZED CRABPOTS WITH AND WITHOUT ANTIFOULING PAINT

Please Note: "For environmental safety reasons, **Tributyl 10** has been taken off the market. Coating pots, however, remains an effective process. Crabbers are advised to use coatings that are **deemed safe."**

A Report Submitted to:

Virginia Sea Grant College Program
203 Monroe Hill House
University of Virginia
Charlottesville, Virginia 22903

by

Virginia Sea Grant Marine Advisory Services

at

Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061
Hampton, Virginia 23669
Lancaster, Virginia 22503

Virginia Institute of Marine Sciences
Gloucester Point, Virginia 23062

Virginia Cooperative Extension Service
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

This project was made possible through the cooperation of the following individuals and organizations:

Virginia Sea Grant Program Investigators

J. Kenneth Riggins
Thomas E. Rippen
Michael J. Oesterling

Participating Fishermen

Rick Parks
Bill Pruitt
Marshal Pruitt
Tom Leggett
Charles Thomas

U.S. Yacht Paint, Watermen Division

John Petit

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INTRODUCTION

Although the wire crabpot is perhaps the most popular device used in Virginia for trapping the blue crab (Callinectes sapidus), corrosion and fouling of the wire mesh limits its longevity and catch potential.

Despite the use of galvanized wire and zinc anodes (sacrificial metal blocks) in conventional crabpot construction, corrosion still deteriorates crabpots, usually rendering them non-serviceable in 1-3 years.

Fouling occurs when marine organisms such as barnacles, algae, hydroids, and bryozoans attach themselves and grow on the wire surfaces of the crabpot, eventually blocking the funnels and bait chamber. Conventional methods used to remove fouling are labor intensive and time consuming, often resulting in lost fishing time. These methods include hand cleaning, high-pressure water spray, air drying, or a combination of these methods.

Vinyl coated wire and antifouling paint have emerged in recent years as alternatives to reduce corrosion and fouling, respectively. Both alternatives have relatively undetermined potentials in the tributaries and Chesapeake Bay region of Virginia.

Unlike vinyl dipped crabpots familiar to many mid-Atlantic fishermen, the vinyl crabpots used in this study were constructed from galvanized wire mesh coated with an epoxy primer and then an 8 mil polyvinyl chloride compound topcoat. This wire is commercially available in several mesh and roll sizes. The chief advantage of vinyl is that it forms an impervious barrier that prevents seawater from penetrating to the underlying wire (except for exposed wire ends). A major disadvantage is that fouling organisms easily attach to the vinyl mesh. As a result, fouling rates of vinyl crab pots have been found to be significantly higher than conventional crabpots (Casey and Dintaman, 1981).

An antifouling paint shown to be effective in reducing fouling on conventional crabpots contains a tri-butyl tin oxide base (Casey and Dintaman, 1981). The paint can be applied on crabpots by a sprinkle or dip method and normally is sufficient to inhibit fouling for one season.

Virginia fishermen have been reluctant to adopt the use of vinyl coated wire and antifouling paint largely because of uncertain economic advantages. Also the unavailability of research that might substantiate use of these options has further hindered an objective decision by Virginia fishermen.

Thus, two major objectives are established in this research. The objectives are as follows:

(1) To determine if the vinyl crabpot is more cost effective than the conventional crabpot.

(2) To compare the fouling rates of the following crabpot types:

a. Conventional crabpots

b. Conventional crabpots coated with antifouling paint

c. Vinyl crabpots

d. Vinyl crabpots coated with antifouling paint.

Objective (1) is long term and will be completed in the future. Objective (2) concerns this study conducted in the 1983 crabbing season.

Since Virginia fishermen have been reluctant to accept vinyl wire and antifouling paint as alternative considerations, the accomplishment of these objectives is anticipated to provide Virginia fishermen a sound base for evaluating the economic benefits they may offer.

LITERATURE REVIEW

There are few scientific studies on the effectiveness and accrued benefits of antifouling paint. Only recently have organized investigations been conducted on crabpot antifouling paint.

During 1979, Casey and Early (1980) studied the effects of attached fouling of crabpots in Chincoteague Bay, Maryland, by fishing with a control pot and two differentially treated pots. Control pots were standard galvanized pots (18 gauge wire construction, 1.5 inch hexagonal mesh, 4 entrance funnels) with 2 sacrificial zinc anodes, as are used by commercial crabbers. Thirty pots were used as controls. An additional 30 pots were similar to the controls with the exceptions that they were hot-dip galvanized and no anodes were used. Finally, 30 standard pots were painted with a butyl-tin base antifouling paint and equipped with 2 anodes. Although their fishing schedule did not approximate commercial conditions, results indicated that the amount of fouling was not significantly different between the control and hot-dip galvanized pots for any sample day, ($p < 0.05$). However, tests between these two pot types and painted pots always showed a significant difference in fouling, painted pots fouling less, ($p < 0.05$). Their analysis of catch per unit of effort revealed no significant differences between pot types ($p < 0.05$).

A similar study was conducted within Chesapeake Bay near Kent Island, Maryland, during 1980 (Casey and Dintaman, 1981). The control pot was identical to Casey and Early (1980), as was the painted pot. However, in place of the hot-dip galvanized pot used by Casey and Early (1980), a 1.5 inch hexagonal mesh black vinyl wire pot was used. Compared to the other test pots, vinyl pots fouled more rapidly, confirming observations made by fishermen. Standard anode pots fouled at a rate approximately 32% less than the vinyl pots. Painted pots proved to foul the least, 83% less than vinyl pots and 75% less than standard pots (Casey and Dintaman, 1981). Using anode depletion criteria, Casey and Dintaman further showed that electrolysis was reduced on painted pots compared to unpainted galvanized pots. Perhaps most importantly, however, were significantly different percentages of total catch contributed by each pot-treatment: painted pots, 42%; standard pots, 34%; vinyl pots, 24%. Casey and Dintaman concluded that the treatment of standard pots with approved antifouling paint could increase not only catch but also lengthen the life of the pot.

Following the apparent success of antifouling paint in retarding fouling in Maryland, more interest was shown for applications in other regions. This interest was further generated by promotional demonstrations of crabpot painting by the producer of one brand of antifouling paint, U. S. Yacht Paint, Waterman Division.* Working with Sea Grant Marine Advisory Programs in various states, U. S. Yacht Paint provided equipment and paint for demonstration purposes. Commercial crabbers were permitted to paint 10-15 of their own pots while observing the techniques used and hearing the merits of this particular brand of antifouling paint. Crabbers were then able to evaluate personally the effectiveness of the paint.

One such demonstration project was conducted in Florida (Andree, 1982; Stevely, 1984). Andree presented subjective comments from crabbers who participated in painting demonstrations. Although crabbers did not indicate a catch difference between painted and unpainted pots, they did report favorably on the antifouling properties of the paint. The conclusion of the Florida crabbers was that the extra cost of painting pots was worthwhile since no fishing time was lost cleaning pots and the pots lasted longer (Andree, 1982). In conjunction with these demonstration paintings, Stevely (1984) attempted to quantify results on catch rates of painted and unpainted pots. Despite data collection problems, 3 sets of data were sufficiently complete for statistical analysis. Two of the 3 sets of data were found to have significantly higher catches in the painted

*Mention of trade names does not constitute endorsement by the Virginia Sea Grant College Program and is used for information purposes only.

pots. The greatest increase was obtained under unusual fishing conditions of long soak period (4 days) and low abundance. Stevely concluded that catch probably depended on pot location, where variations in the degree of fouling and crab population affected the catch potential.

MATERIALS

EXPERIMENTAL CRABPOTS

Construction:

90 vinyl and 90 galvanized wire crab pots and accessories were purchased from Peeles' Crab Pots and Supplies, Norfolk, Virginia.* All pots were constructed from 1.5 inch twisted hexagonal, 18 gauge wire with .5 square inch mesh, 16 gauge wire bait chambers. All pots had four entrance funnels and measured 24 inches tall and 24 inches at the base.

Accessories consisted of .375 inch irons for all pots, 12 ounce zinc anode bars for the vinyl pots and 24 ounce bars for the galvanized pots, floats, cord, and latches. Although zinc anodes were not necessarily required on vinyl pots, small anodes were attached as control variables.

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Types:

Four types of pots were tested in each area. Pot types were designated according to the letters described as follows:

A - galvanized pot

B - galvanized pot with antifouling paint

C - vinyl pot

D - vinyl pot with antifouling paint

Identification:

In order to standardize the data in all three areas, each crabpot was identified by a code. The first number indicated the crabpot location in the following manner:

1 - Hampton Roads

2 - York River

3 - Balls Creek/Chesapeake Bay

The middle letter indicated pot type (A, B, C, or D). The last number designated a pot within a particular pot type. In each area there were 15 pots per type.

ANTIFOULING PAINT AND EQUIPMENT

Antifouling paint and application equipment were donated by U. S. Yacht Paint, Waterman's Division, Roseland, New Jersey. A sprinkle application method was used to paint the pots. Sprinkling equipment included a galvanized metal catch tank supported by a wood stand, 1/10 Hp centrifugal pump and motor, flexible tubing with a spray nozzle. A schematic representation of this system is depicted in Appendix A.

PROCEDURE

LOCATION

The crab pot study was conducted in the following geographic areas: Hampton Roads (Area 1), York River (Area 2), and Balls Creek and Chesapeake Bay area of Northumberland County (Area 3).

Area 1:

On June 25 crab pots were set off Buckroe Beach in 5-10 feet of water. Three weeks later one half of the pots were moved further offshore in 10-15 feet of water. The pots remained at this location until August 7.

From August 8 to September 20, the pots were relocated to Hampton Bar in Hampton Roads. One half of the pots were placed on the bar in 4-5 feet of water and the other half placed offshore from the bar in 10-20 feet of water.

Bottom conditions varied from sand in the shallow areas to mud in the deeper offshore areas. Strong currents and heavy boat traffic in the study area were responsible for the loss of 20 pots during the season.

Area 2:

Crabpots were located in the lower York River near the Guinea Marshes from June 9 through September 2. Pots were set in two parallel lines, one line in 4-8 feet of water, the other line in

10-20 feet of water. Both lines extended from Buoy 8 to R "22" (Swash Channel to Jenkins Neck/Hog Island).

From September 3 through September 16, the pots were relocated on both sides further up the York River. On the south side, pots were set from the Naval Weapons Station dock upriver toward Cheatam Annex for a distance slightly more than 3 statute miles. Pots on the north side extended from marker R "28" (below the Mumfort Islands) upriver to marker R "34" (near Cedarbush Creek). The bottom varied from sand to mud, with scattered eel grass and algal beds. Salinity and water temperature exhibited seasonal variation during the study, ranging from 16 to 24 parts per thousand and 43° F to 79° F respectively. Five crab pots were lost throughout the season.

Area 3:

Crabpots were located in Balls Creek and within a half mile radius of the mouth of the creek in the Chesapeake Bay. Depths ranged from 3-5 feet in the creek to 10-20 feet in the Chesapeake Bay. The bottom varied from sand to mud, being primarily sand in Balls Creek and mud in the Chesapeake Bay. Strong currents and an abundance of crabs were particularly noticeable in Balls Creek. Six pots were lost during the season.

FISHERMEN'S RESPONSIBILITIES

In each area one commercial fisherman was selected to fish the experimental pots for the entire season. The fishermen were required to rig, bait, fish, and clean (as specified) the pots according to their normal routines. In Areas 1 and 3 the pots were used as purchased. In Area 2 the pots received additional bracing.

DATA COLLECTION

Data collection consisted of measuring three parameters considered to be useful in evaluating the fouling rate of each pot type. These parameters were: 1) weight of each crabpot, 2) visual fouling score of each crabpot, and 3) volume of catch per crabpot type.

The frequency of data collection varied but was typically gathered once every 7 to 10 days. Guidelines used for collecting the data were standardized in all three areas as detailed in Appendix B. Appendix C is a standard form used for recording data.

Crabpot weights:

Crabpots were weighed to provide an objective measure of fouling. Weights were measured on a 20 pound capacity hanging scale and recorded to the nearest ounce. In Areas 1 and 3 the scales were attached to an overhead beam which facilitated on board weighing. In Area 2 the scale was hand held. Wind and rough seas occasionally created difficulty with on board weighing in Areas 1 and 3. In Area 2 only the initial and final weights were recorded.

Visual fouling score:

The visual fouling score was a subjective assessment of the progression of fouling based on a numerical scale ranging from 0 (no fouling) to 4 (heavy fouling). Each crabpot was visually inspected and assigned a number according to the level of fouling.

The fishermen were required to clean the crabpots by type when more than one half of the pots of a particular type reached a "4" foul level. Cleaning was accomplished by air drying or hand cleaning. In Area 3 the galvanized pots were relocated from the Chesapeake Bay to Balls Creek on day 43 where a large number of crabs in essence cleaned the galvanized pots over a period of several days.

Volume of catch:

The total catch per crabpot type was measured on each day that data was collected. It was anticipated that this would be another useful method to compare crabpot types since fouling was expected to reduce catch.

In Areas 1 and 3 catch was measured in bushels and recorded to the nearest 1/8 of a bushel. In Area 2, catch was measured in pounds and then converted to bushels on a 40 pounds per bushel basis.

In order to ease the task of measuring catch, crabpot types were not mixed but were grouped according to type. Although mixing the pots may have randomized uncontrolled variables, the impracticality of doing so eliminated this option.

DURATION

The duration of the research varied with each area. In Area 1 fishing began on June 25 and ended on September 20, a duration of 97 days. Fishing began in Area 2 on June 9 and ended on September 16, lasting 100 days. In Area 3 fishing began on May 23 and ended on September 21, a duration of 129 days.

ELECTROLYSIS

Measurable weight gains of the galvanized crabpots were significantly offset by electrolysis. To compensate for this weight loss, galvanized and painted galvanized pots were cleaned and weighed. Then a linear equation was developed for each area based on the difference between the initial and final weight of each pot. The two weight loss rates were similar and consequently were averaged prior to modifying the weights actually measured during the season. This procedure was used in all three areas. The resulting equations were as follows:

Area 1: $y = .01566x$

Area 2: $y = .01376x$

Area 3: $y = .00912x$

y = weight loss from electrolysis (pounds) and x = time (days)

x = time (days)

Also two vinyl pots from Area 1 and 3 were cleaned and weighed to determine if any weight loss occurred. In addition, since anode depletion was expected to be the primary cause for weight loss, particularly with vinyl pots, anode bars from four vinyl pots in each area were weighed at the beginning of the season and compared with their weights at the end of the season. No significant differences existed between initial and final weights of the vinyl pots or the anode bars. Thus the vinyl pot weights were used as actually measured.

STATISTICS

Fouling scores, crab pot weights and catch of the four crabpot types in each study area were evaluated by analysis of variance for balanced data and, where indicated, means compared by Tukey's procedure. Significance was indicated at alpha = .05. Statistical procedures were implemented with the Statistical Analysis System (SAS Institute Inc., Cary, N.C.) interfaced with the mainframe computer at Virginia Tech.

Crab pots lost during the season were excluded from analysis leaving n = 11 to n = 14 for each pot type depending on area. Since most crabpots required one or more cleanings, the data was partitioned into periods of undisturbed fishing for comparison in Areas 1 and 3. Pot types were compared over the span of these periods as well as between each sample day within the periods.

Crabpot weights were normalized to correct for differences in initial weights among the four pot types.

RESULTS AND DISCUSSION

HAMPTON ROADS

Rapid fouling necessitated frequent cleaning of crabpots in this area. Perhaps as a consequence, an overall most foul-resistant pot type was not immediately apparent (see Table 1, Figures. 1-2, and Appendices D-N). However by day 56 and up to the first cleaning (following day 62), the painted galvanized pot gained the least amount of weight and by days 33 through 62 was least visually fouled of the four pot types, $p<.05$.

Antifouling paint inhibited the accumulation of fouling organisms on galvanized and vinyl pots as indicated by lower weight gains by day 56 and up to the first cleaning and by lower foul scores on days 33 through 62 and again on day 79 two weeks after cleaning, $p<.05$.

By day 19 and up to the first fishing break (following day 26), painted vinyl crabpots maintained significantly lower weights than galvanized pots. After the first fishing break there was no difference in weights except on day 69, when the galvanized pots weighed less, $p<.05$. No differences between the two types were detected visually, $p<.05$.

Overall, wire crabpots appeared to foul less than vinyl pots, and painted galvanized fouled least. Possible early season advantages to painted vinyl pots compared to standard galvanized pots were obscured later, suggesting a need to reapply antifouling paint during the season. A similar conclusion can be made between painted galvanized crabpots and galvanized pots;

Table 1. Hampton Roads mean crabpot weights, foul scores and catch results for the periods shown.

	Crabpot Weight (lbs.) Period (day)				Foul Score Period (day)				Catch (bu) Period (day)			
Crabpot type	0-26	33-62	69-79	97	0-26	33-62	69-79	97	0-26	33-62	69-79	97*
galvanized	10.0^{ab}	10.9^{b}	11.1^{bc}	10.8^{b}	0.0^{b}	1.7^{b}	2.0^{b}	2.4^{b}	1.3^{a}	2.4^{a}	1.2^{a}	1.9
painted galv.	10.1^{a}	10.4^{c}	10.7^{c}	10.9^{b}	0.0^{b}	0.2^{c}	1.4^{c}	2.6^{ab}	1.6^{a}	3.1^{a}	1.7^{a}	2.8
vinyl	10.2^{a}	11.5^{a}	12.5^{a}	12.0^{a}	0.7^{a}	2.6^{a}	2.8^{a}	3.3^{a}	1.5^{a}	2.4^{a}	1.6^{a}	2.7
painted vinyl	9.8^{b}	10.8^{b}	11.4^{b}	11.0^{b}	0.0^{b}	1.7^{b}	2.2^{b}	3.1^{ab}	1.0^{a}	2.1^{a}	1.2^{a}	0.5

* results were not significant due to insufficient data, n = 1.

[abc] Means within columns with different superscripts are significantly different, $p < .05$.

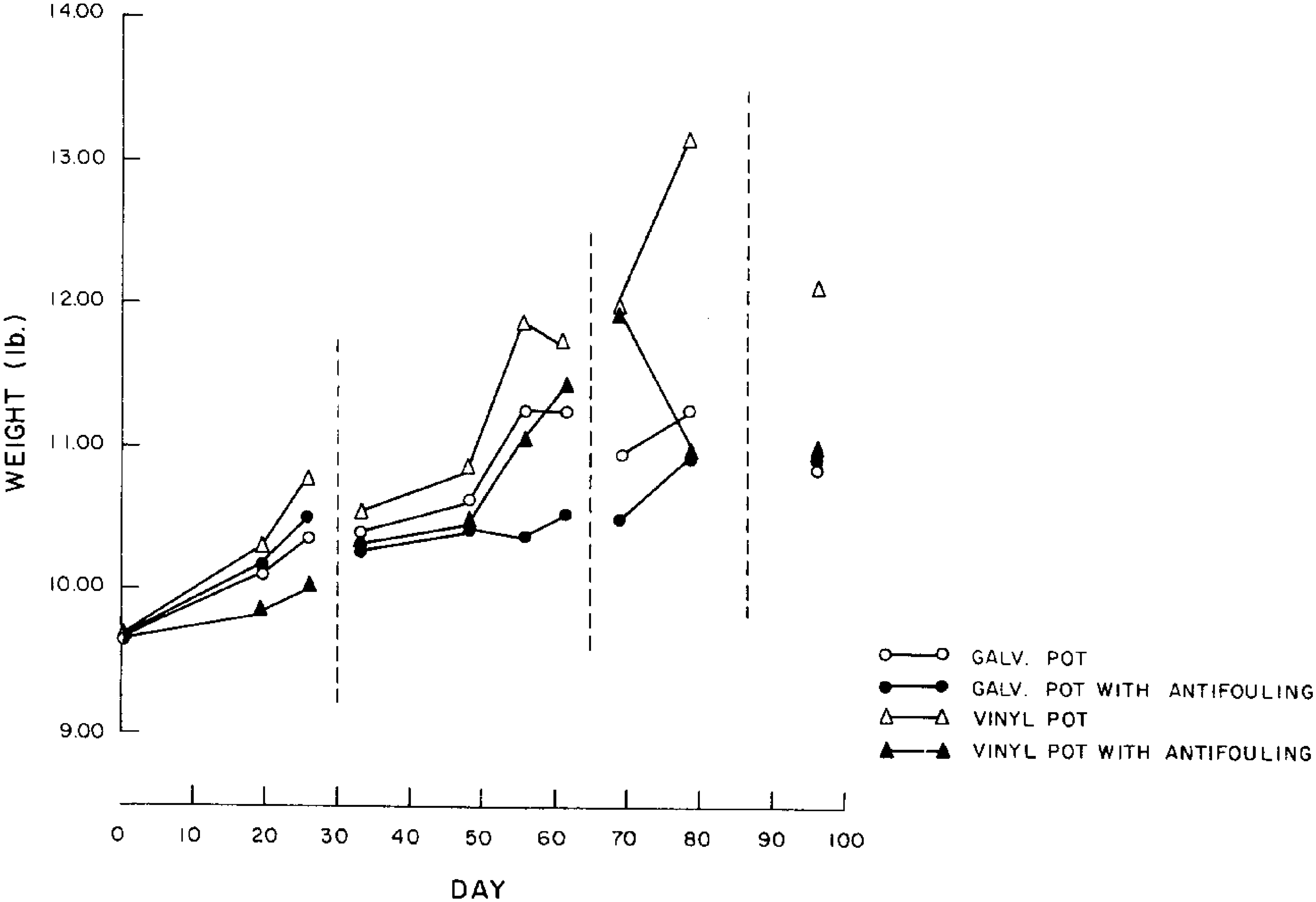

Figure 1. Crabpot weight plotted as a function of time in Area 1. Data points represent mean values. The first vertical dashed line represents air drying of vinyl and painted galvanized pots; the second and third vertical dashed lines indicate spot cleaning of some pots in each type.

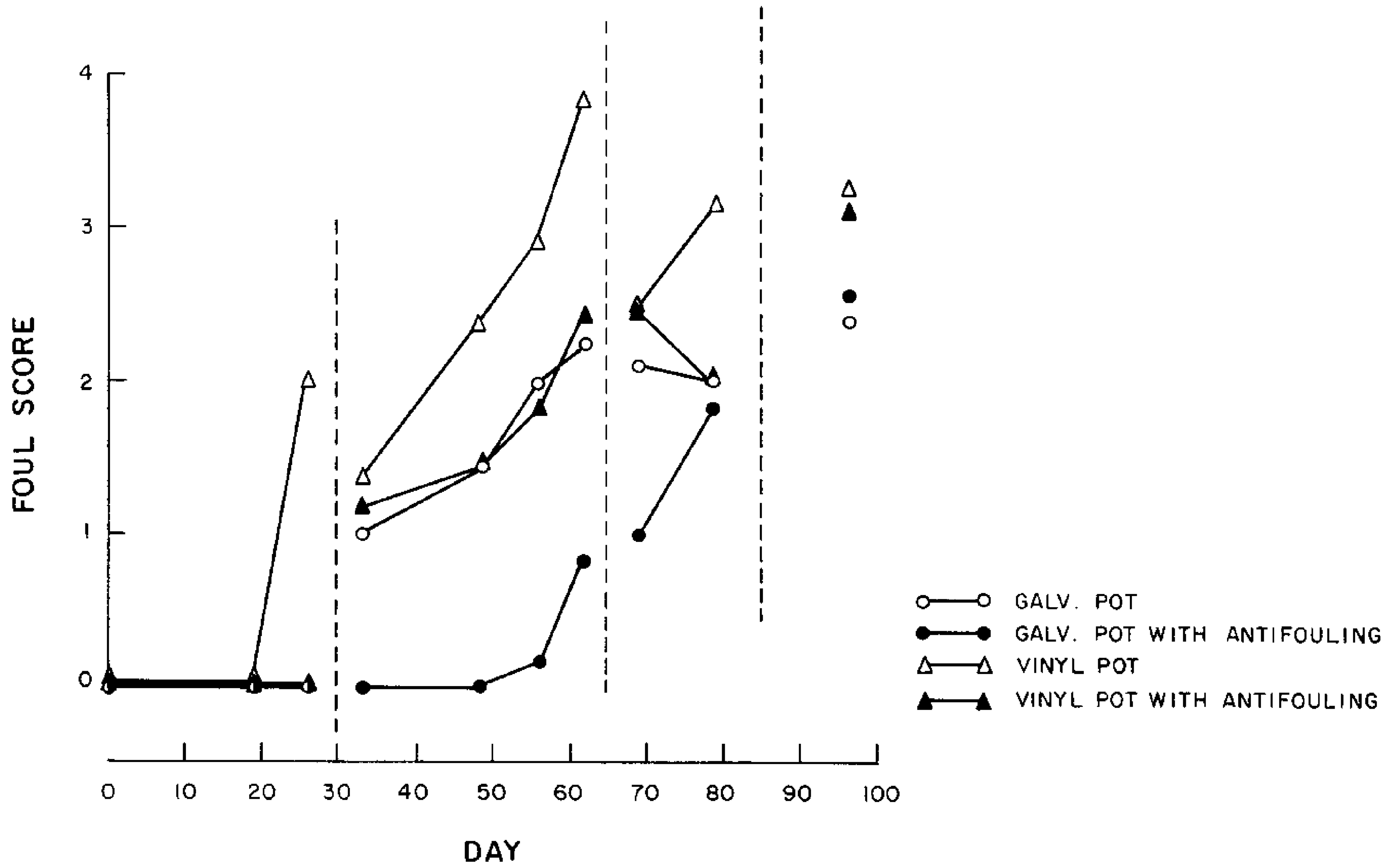

Figure 2. Crabpot foul score plotted as a function of time in Area 1. Data points represent mean values. The first vertical dashed line represents air drying of vinyl and painted galvanized pots; the second and third vertical dashed lines indicate spot cleaning of some pots in each type.

however due to cleaning breaks the need for repainting was not clearly demonstrated.

No significant differences in catch volume were detected among the four crabpot types. Harvest variability apparently due to locational and other uncontrolled effects were high, accounting for 55 to 82 percent of the variance during the season (Appendix F).

YORK RIVER:

Since crabpot weights were recorded only at the beginning and end of the season, pot weights could only be used on a limited basis in making comparative analyses. The results for this area are shown in Table 2, Figures 3-4 and Appendices O-Q.

The foul scores and final weights showed conclusively that the unpainted vinyl pot fouled at a faster rate than the other pot types, $p<.05$. The foul scores of the galvanized, painted galvanized, and painted vinyl pots exhibited wide fluctuations from one date to the next, which consequently made it difficult to draw conclusions for these pot types.

Overall foul score results (Table 2) showed no significant difference between the painted vinyl and galvanized pots, $p<.05$. However, painted vinyl pots were more visually fouled than galvanized pots on days 44, 79, 86, and 100 and less visually fouled on day 65, $p<.05$. Painted vinyl pots were significantly heavier than galvanized pots, $p<.05$. Furthermore the foul score for the painted vinyl pots was greater (more fouled) than painted galvanized pots beginning on day 44 and extending to the end of the season except on day 86 and 93 when there were no significant

Table 2. York River mean crabpot weights, foul scores and catch results for the period shown.

	Crabpot Weight (lbs.)	Foul Score	Catch (bu)
	Period (day)	Period (day)	Period (day)
Crabpot type	0-100	0-100	0-100
galvanized	10.7^{a}	0.8^{ab}	2.4^{a}
painted galv.	11.2^{ab}	0.6^{a}	2.2^{a}
vinyl	12.4^{c}	1.7^{c}	2.5^{a}
painted vinyl	12.0^{bc}	1.0^{b}	2.2^{a}

[abc] Means within columns with different superscripts are significantly different, $p < .05$.

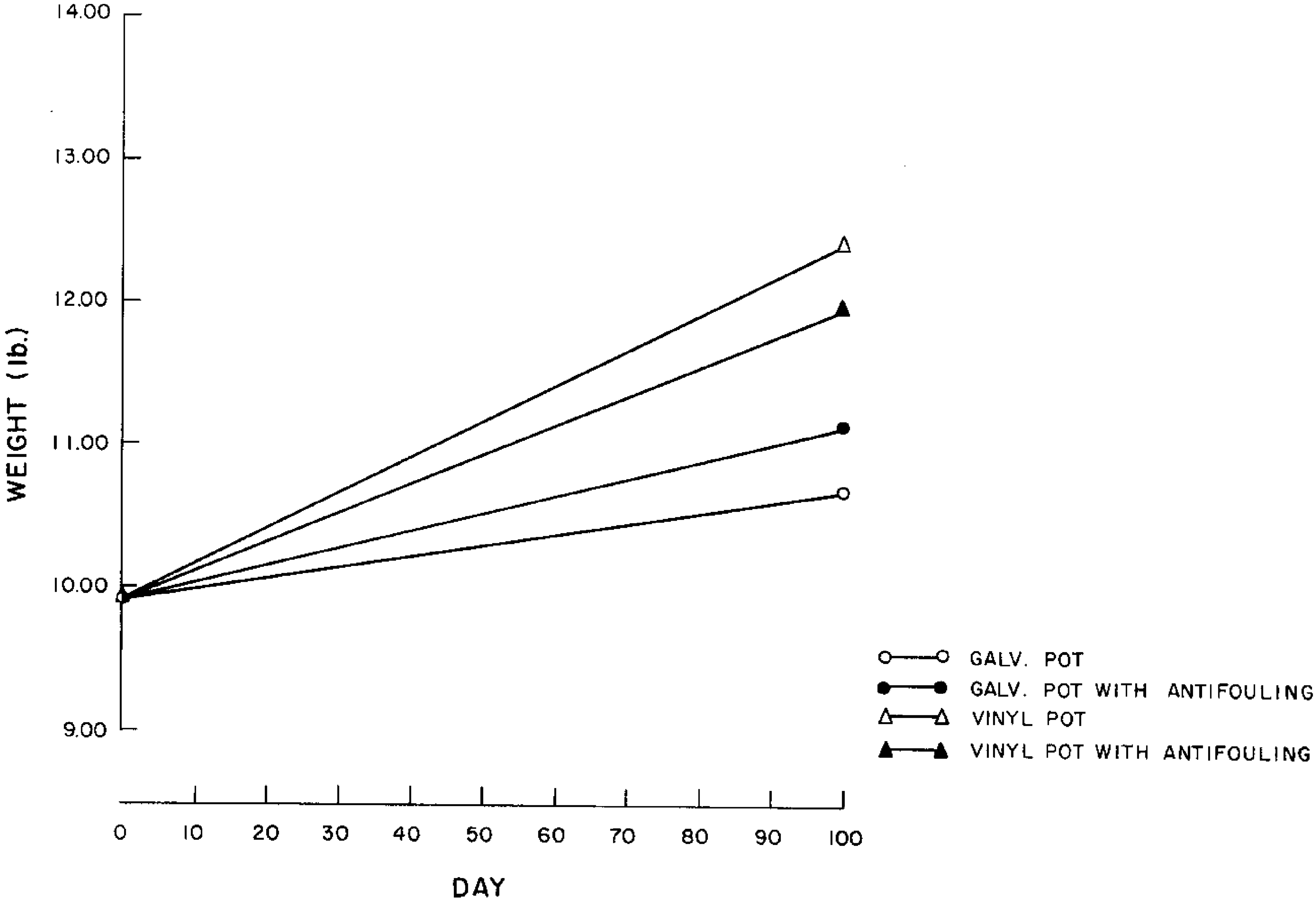

Figure 3. Crabpot weight plotted as a function of time in Area 2. Data points represent mean values. Only initial and final weights were recorded.

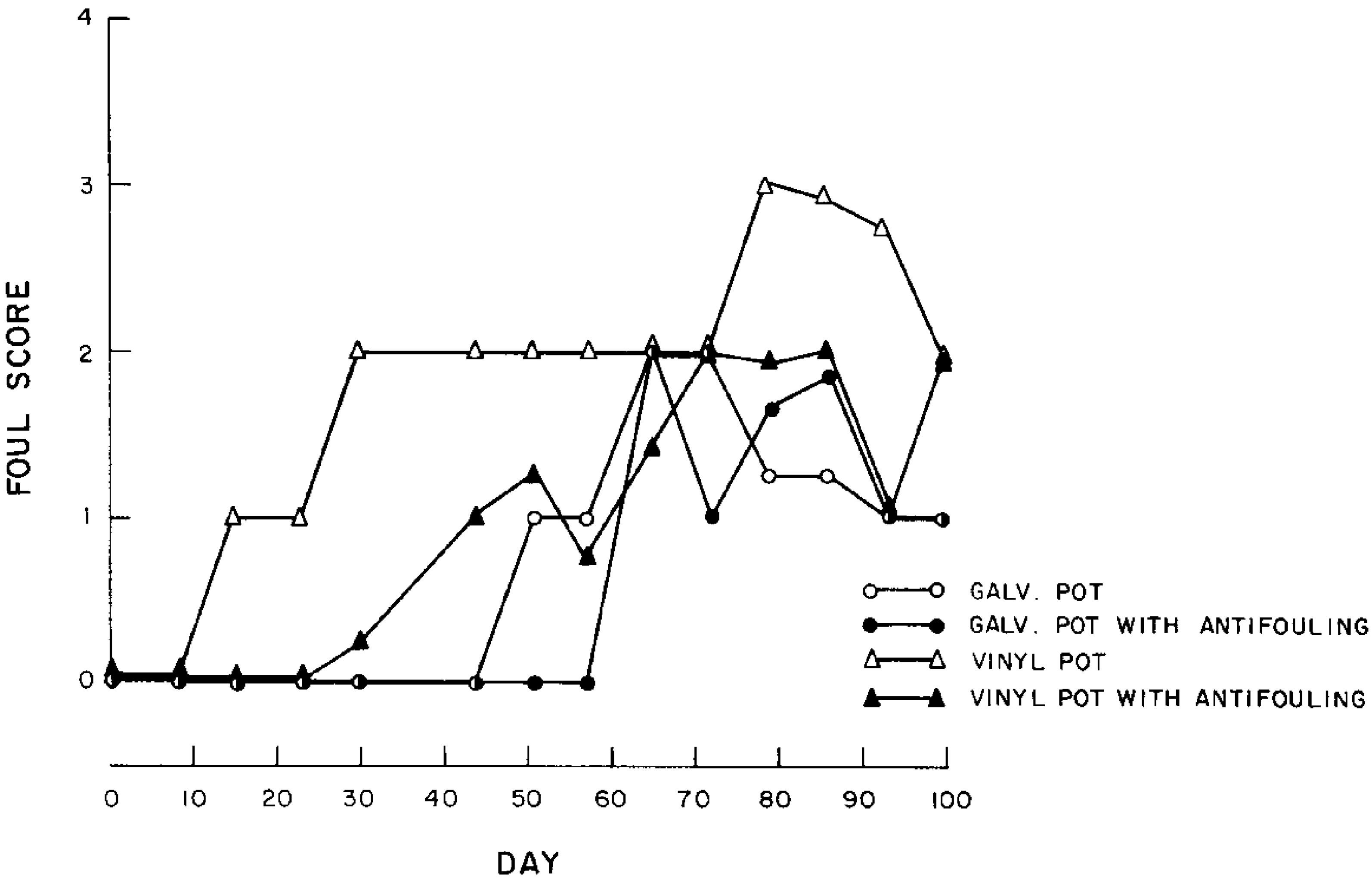

Figure 4. Crabpot foul score plotted as a function of time in Area 2. Data points represent mean values.

differences, $p<.05$. The final weight results for the two painted pot types were not significantly different, $p<.05$.

The results demonstrated that antifouling paint reduced fouling on vinyl crabpots but was not as effective as anticipated on galvanized pots. The painted galvanized, galvanized, and painted vinyl pots all appeared to foul at similar rates although periodic differences might rank them in the order listed (least to most fouled).

Catch results could not be used to make comparisons among pot types since no significant differences were reported. Pot location and other uncontrolled effects apparently had a significant impact on catch results, accounting for 98 percent of the variance (Appendix O).

BALLS CREEK CHESAPEAKE BAY (NORTHUBERLAND COUNTY)

Results for Area 3 are shown in Table 3, Figures 5-6, and Appendices R-Z. Because the galvanized and vinyl pots were cleaned between days 43-53 and days 71-78, respectively, three time periods were tested statistically. These periods were days 0-43, 53-71, and 78-129.

Days 0-43:

The overall foul scores showed that vinyl pots fouled more than all other pot types, $p<.05$. However the weight analysis indicated that although by day 43 the vinyl pots were fouled more than the painted galvanized or painted vinyl pots, they were not significantly different from the galvanized pots, $p<.05$.

Table 3. Balls Creek mean crabpot weights, foul scores and catch results for the different periods shown.

	Crabpot Weight (lbs.)			Foul Score			Catch (bu)		
	Period (day)			Period (day)			Period (day)		
Crabpot type	0-43	53-71	78-129	0-43	53-71	78-129	0-43	53-71	78-129
galvanized	10.2^{a}	10.4^{a}	10.6^{a}	0.2^{a}	0.2^{a}	1.6^{a}	0.3^{a}	1.9^{a}	1.6^{a}
painted gal.	10.1^{b}	10.6^{b}	10.9^{ab}	0.0^{a}	1.3^{b}	2.1^{b}	0.6^{a}	1.9^{a}	2.1^{ab}
vinyl	10.1^{ab}	11.1^{c}	11.6^{c}	0.6^{b}	3.7^{c}	2.3^{c}	0.6^{a}	1.8^{a}	2.3^{b}
painted vinyl	10.0^{c}	10.2^{d}	11.0^{b}	0.0^{a}	0.2^{a}	1.6^{bc}	0.9^{a}	2.1^{a}	1.6^{a}

[abc] Means within columns with different superscripts are significantly different, $p < .05$.

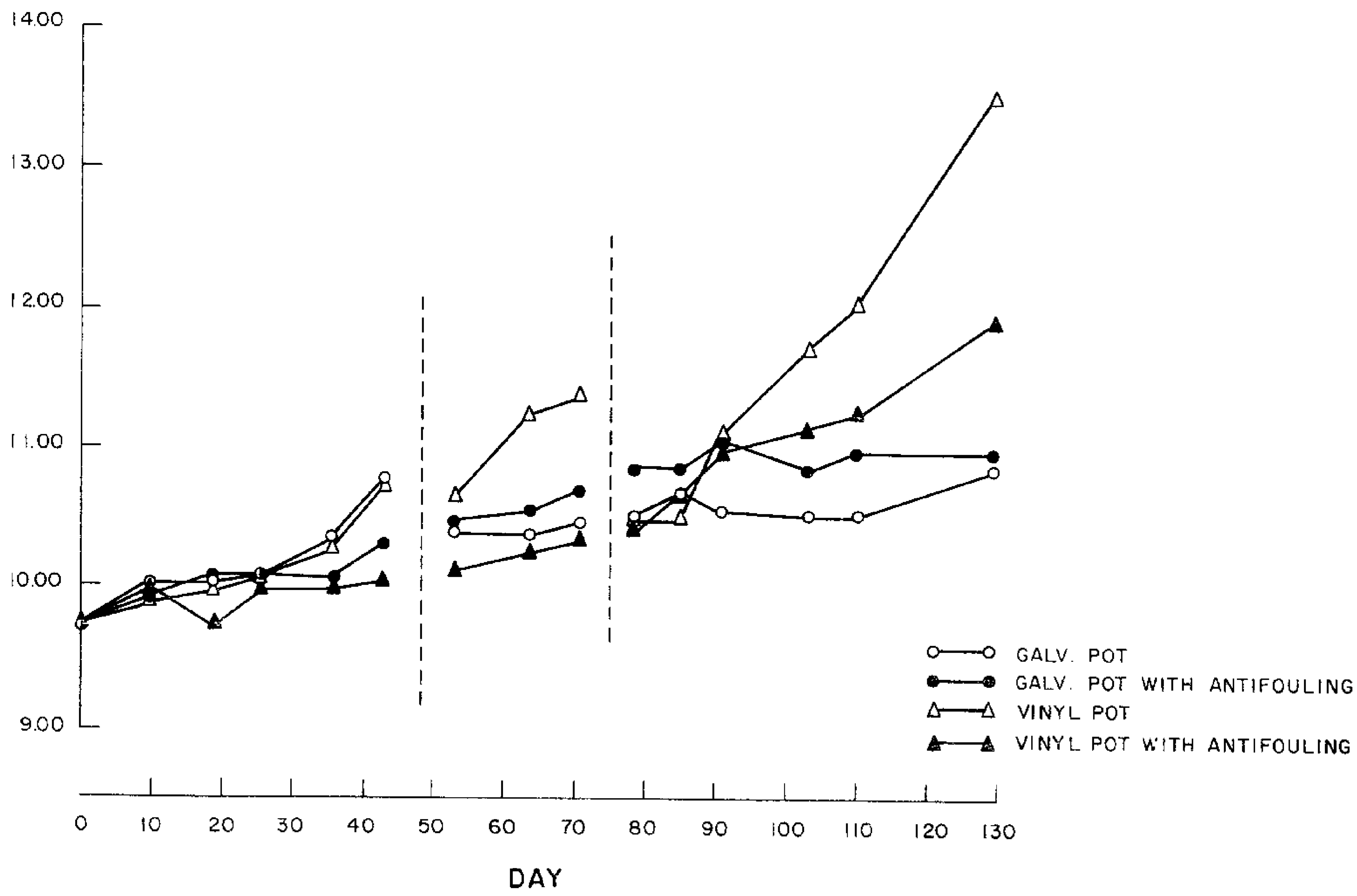

Figure 5. Crabpot weight plotted as a function of time in Area 3. Data points represent mean values. The first vertical dashed line represents cleaning of the galvanized pots; the second vertical dashed line, cleaning of the vinyl pots.

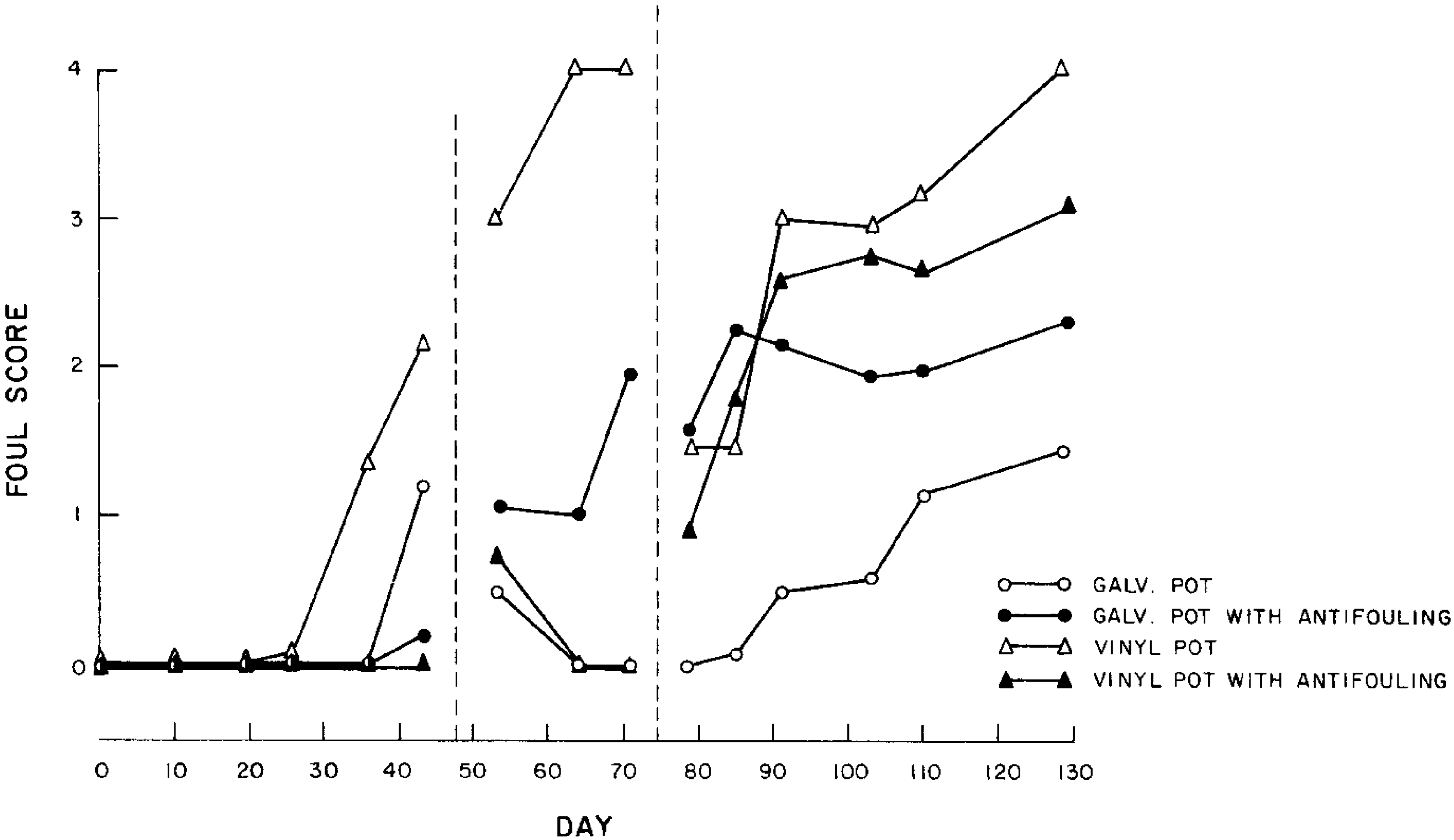

Figure 6. Crabpot foul score plotted as a function of time in Area 3. Data points represent mean values. The first vertical dashed line represents cleaning of the galvanized pots; the second vertical dashed line, cleaning of the vinyl pots.

Foul score and weight analysis both demonstrated that by day 43, galvanized pots were more fouled than painted galvanized and painted vinyl pots and that painted galvanized pots were more fouled than painted vinyl pots, $p<.05$.

Overall, during this period, the painted vinyl pot appeared to be the least fouled. The galvanized and painted galvanized pots were equally fouled and the unpainted vinyl pot seemed to be the most fouled.

Days 53-71:

The foul score and weight analysis clearly showed that the vinyl pots fouled more than the other pots, $p<.05$. Also shown was that painted galvanized pots fouled significantly more than the galvanized or painted vinyl pots, $p<.05$.

The weight analysis indicated that painted vinyl pots fouled less compared to other pots, $p<.05$. This result however was not substantiated by the foul score which showed no significant difference between galvanized and painted vinyl pots, $p<.05$.

The painted vinyl pot again appeared to be the most effective pot type during this period. Unlike the previous period, painted galvanized pots fouled more than galvanized pots. The probable cause for this reversal was the relocation of the galvanized pots to Balls Creek where strong currents and large numbers of crabs kept fouling to a minimum.

The unpainted vinyl pot was the most fouled pot type during this period.

Days 78-129:

During this period fouling of the painted vinyl pots increased considerably. According to the foul score, there was no significant difference between the vinyl and painted vinyl pots, $p<.05$. However, the weight analysis indicated that the vinyl pots were still more fouled than other pot types, including the painted vinyl, $p<.05$.

The foul score and weight analysis revealed no significant difference between the painted vinyl and painted galvanized pots, $p<.05$. Although the weight analysis did not indicate any significance between galvanized and painted galvanized pots, the foul score for galvanized pots was significantly less than for the other pot types, $p<.05$.

The cleaning effect of strong currents and crabs in Balls Creek on galvanized pots was further observed during this period. The other pot types, the painted vinyl perhaps most dramatically, declined in antifouling effectiveness. As the other periods show, the vinyl pot in this period appeared to foul more than other pot types.

Catch:

No significant differences in catch results were reported. Since catch varied extensively, it could not be used to effectively evaluate and compare pot types. Throughout the season it appeared that catch depended more on pot location and other uncontrolled factors which accounted for 56 to 96 percent of the variance (Appendix T).

CONCLUSIONS

It was the consensus of the researchers that antifouling paint does retard fouling but may not be economically justifiable in certain circumstances. Perhaps the most significant benefit was derived from its use on vinyl crabpots, on which fouling was consistently lower compared to unpainted vinyl pots. The tendency for vinyl pots to foul at rapid rates makes it essential that commercial crabbers using vinyl crabpots consider antifouling paint application.

The decision to use antifouling paint on galvanized wire crabpots, however, may depend on several factors. If crabpots are to be located in deep undisturbed areas, antifouling paint may be very beneficial. On the other hand, antifouling paint may not be as beneficial in areas where strong currents, large numbers of crabs, or other cleaning forces prevail.

All crabpots used in this study were approximately three months old when painted. Thus the extent that pot age affected paint application and adherence was not determined. However based on reports of individuals participating in painting demonstrations conducted during the 1983 crabbing season and the claims of the manufacturer, antifouling paint applies and adheres better to older crabpots than to new pots. New pots should be allowed to "weather" (oxidize) sufficiently before painting for maximum benefit; otherwise the value of antifouling paint is questionable.

A demonstrable increase in catch would clearly justify the additional cost of antifouling paint. Previous studies of antifouling paint showed both significant and non-significant relationships between fouling and catch. This study did not reveal any significant correlation between fouling and catch.

Clean crabpot surfaces are necessary for maximum adherence of antifouling paint. Time and labor requirements to accomplish proper cleaning of the pots must be considered. If crabpots are cleaned and painted during the crabbing season, it should be justified by an increase in crab catch to recover lost productivity as well as paint and equipment costs. On the other hand, it is expected that by cleaning and painting the pots, the frequency of cleaning during the season will be reduced with a corresponding increase in the fishing time the pots will provide.

A careful evaluation of these factors on an individual basis should provide commercial crabbers with the necessary information to determine the usefulness of antifouling paint. Although this research does substantiate claims that antifouling paint reduces fouling, it does not support an unqualified use of the product.

REFERENCES

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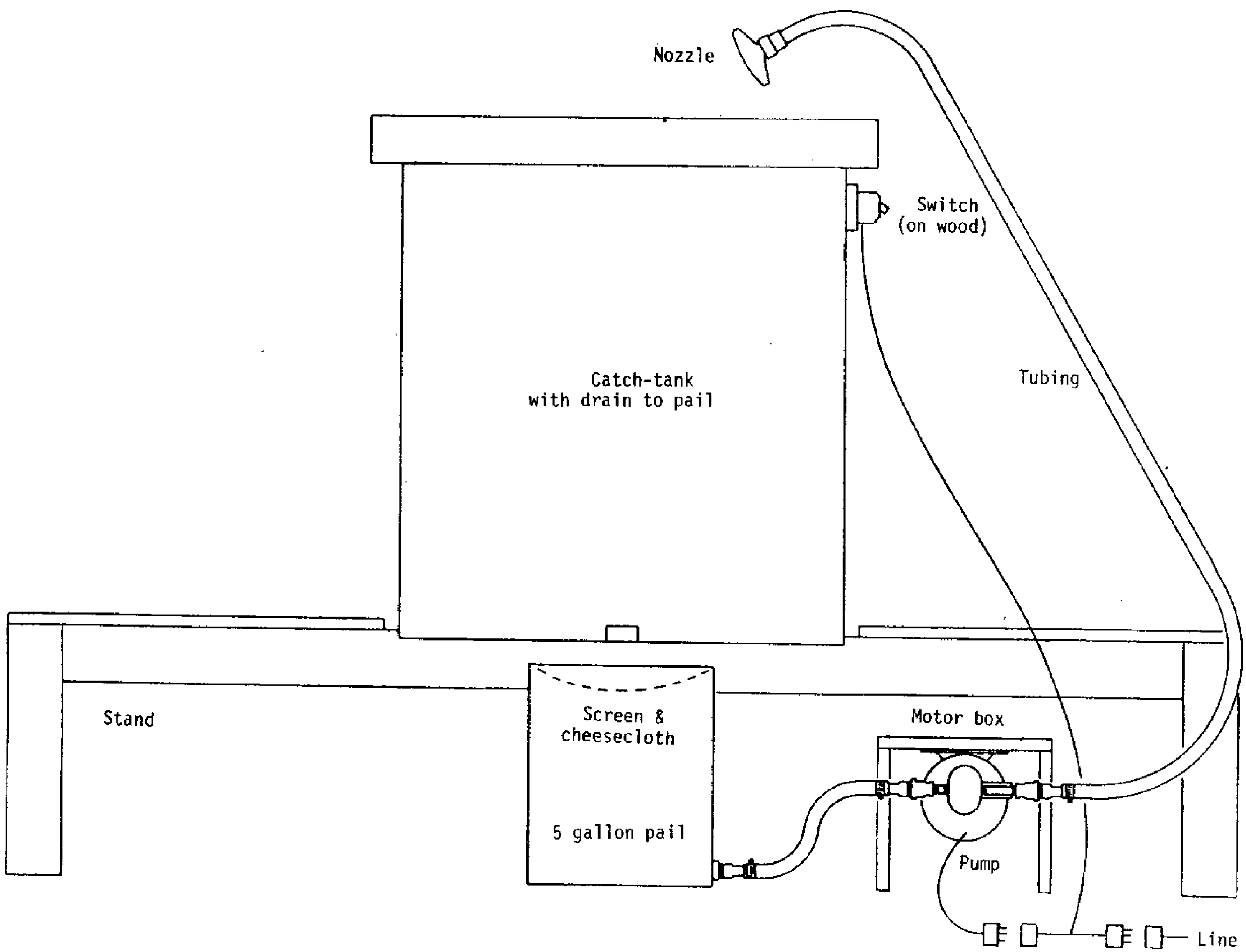
Casey, J. F. and R. S. Early. 1980. Effect of pot treatment on pot fouling and catch of blue crabs in Chincoteague Bay, Maryland. Unpublished manuscript, Maryland Department of Natural Resources, Annapolis, Maryland. 12 pp.

Stevely, John. 1984. Report on the results of a Florida Sea Grant demonstration project to evaluate the effectiveness of painting blue crab traps with antifouling paint. Unpublished manuscript, Florida Marine Advisory Program, Gainesville, Florida. 12 pp.

Appendix A. Schematic representation of antifouling paint application equipment (Courtesy of U.S. Yacht Paint, Waterman Division, Roseland, N.J.).



Appendix B. Guidelines used for collecting data.

POT WEIGHT: Weigh each pot on the scales provided. Record weight to the nearest ounce. Before weighing make sure bait chambers are clean and any abnormal object(s) on or in the pot is removed (i.e., jellyfish, oyster shells, etc.) Beginning at the pot measure about 6 in. of float line. Form a U-shaped loop level with the point at which the line is attached to the pot. Hold the loop while weighing.

FOUL SCORE: Record 0, 1, 2, 3, or 4 according to the following description:

0 - no fouling. No visable sign of fouling except perhaps only very little noticed at scattered places on the pot.

1 - slight fouling. A small but definitely established amount of fouling on funnels and bait chamber.

2 - moderate fouling. Fouling is observed on funnels and bait chamber. Also it begins to spread to surrounding surfaces. However, crabs are still potted fairly well. Cleaning the pot is not economical.

3 - moderately heavy fouling. Fouling begins to get heavy on funnels and bait chamber. Catch rate begins to decline. Cleaning the pot is economical.

4 - heavy fouling. Funnels and bait chamber are overgrown with fouling. Catch rate has dropped off sharply. Cleaning the pot becomes mandatory.

CATCH: Determine the total volume of crabs caught in each pot type. Use bushel baskets and record to nearest 1/8 bushel. Make sure baskets are completely empty before fishing next pot type.

Appendix C. Data Sheet
Date:

POT#	POT WEIGHT*	FOUL RATE*	POT#	POT WEIGHT	FOUL RATE	POT#	POT WEIGHT	FOUL RATE	POT#	POT WEIGHT	FOUL RATE
1A1			1B1			1C1			1D1		
1A2			1B2			1C2			1D2		
1A3			1B3			1C3			1D3		
1A4			1B4			1C4			1D4		
1A5			1B5			1C5			1D5		
1A6			1B6			1C6			1D6		
1A7			1B7			1C7			1D7		
1A8			1B8			1C8			1D8		
1A9			1B9			1C9			1D9		
1A10			1B10			1C10			1D10		
1A11			1B11			1C11			1D11		
1A12			1B12			1C12			1D12		
1A13			1B13			1C13			1D13		
1A14			1B14			1C14			1D14		
1A15			1B15			1C15			1D15		
*VOLUME:			VOLUME:			VOLUME:			VOLUME:		

* See instruction sheet

Appendix D. Analyses of variance for Hampton Roads crabpot weights as affected by crabpot type.

Day 0-26

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot & day	11	16.2871	1.4806	48.16	0.0001	0.8153	1.746
Error	120	3.6895	0.0307		STD DEV		Wt Mean (lbs.
Corrected Total	131	19.9766			0.1753		10.042

Day 33-62

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot & day	15	81.0491	5.4033	45.54	0.0001	0.7951	3.167
Error	176	20.8812	0.1186		STD DEV		Wt Mean (lbs.
Corrected Total	191	101.9303			0.3444		10.874

Day 69 and 79

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot & day	7	55.4198	7.9171 1	16.34	0.0001	0.5884	6.090
Error	80	38.7654	0.4846		STD DEV		Wt Mean (lbs.
Corrected Total	87	94.1852			0.6961		11.430

Day 97

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot	3	7.2069	2.4023	17.69	0.0001	0.6886	3.298
Error	24	3.2589	0.1358		STD DEV		Wt Mean (lbs.)

Appendix E. Analyses of variance for Hampton Roads foul scores as affected by crabpot type.

Day 0-26

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = foul score x pot & day	11	40.3333	3.6666	10.00	0.0000	1.0000	0.000
Error	120	0.0000	0.0000		STD DEV		Foul Score Mean
Corrected Total	131	40.3333			0.0000		0.167

****

Day 33-62

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = foul score x pot & day	15	186.6363	12.4424	65.17	.0001	0.8593	27.862
Error	160	30.5454	0.1909		STD DEV		Foul Score Mean
Corrected Total	175	217.1818			0.4369		1.568

****

Day 69 and 79

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = foul score x pot & day	7	29.9886	4.2841	21.92	0.0001	0.6573	20.805
Error	80	15.6363	0.1954		STD DEV		Foul Score Mean
Corrected Total	87	45.6250			0.4421		2.125

****

Day 97

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = foul score x pot & day	3	3.7143	1.2381	5.20	.0066	0.3939	17.078
Error	24	5.7143	0.2381		STD DEV		Foul Score Mean
Corrected Total	27	9.4286			0.4879		2.857

****

Appendix F. Analyses of variance for Hampton Roads catch as affected by crabpot type.

Day 19-26

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.4330	0.1443	0.29	0.8314	0.1787	51.297
Error	4	1.9900	0.4975		STD DEV		Catch Mean (bu)
Corrected Total	7	2.4230			0.7053		1.375

****

Day 33-62

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	2.0460	0.6820	1.02	0.4165	0.2038	32.736
Error	12	7.9935	0.6661		STD DEV		Catch Mean (bu)
Corrected Total	15	10.0395			0.8163		2.493

****

Day 69 and 79

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.4544	0.1515	1.08	0.4525	0.4475	26.074
Error	4	0.5609	0.1402		STD DEV		Catch Mean (bu)
Corrected Total	7	1.0154			0.3745		1.436

****

Day 97

Anova not meaningful, Error DF = 0.

Catch Mean 1.967 bu

****

Appendix G. Comparison of mean weight for Hampton Roads, day 0-26, by Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	WEIGHT (lbs.)	POT[2]	DAY
A	10.74	V	26
B	10.48	PG	26
B			
C B	10.32	G	26
C B			
C B D	10.26	V	19
C D			
C E D	10.19	PG	19
E D			
E D	10.07	G	19
E			
F E	10.00	PV	26
F			
F G	9.79	PV	19
G			
G	9.66	PG	0
G			
G	9.66	V	0
G			
G	9.66	G	0
G			
G	9.66	PV	0

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix H. Comparison of mean weight for Hampton Roads, day 33-62, by Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	WEIGHT (lbs.)	POT[2]	DAY
A	12.71	V	62
B	11.81	V	56
C B	11.39	PV	62
C D	11.25	G	56
C D	11.21	G	62
C D E	11.02	PV	56
F D E	10.79	V	48
F G E	10.63	G	48
F G	10.51	PG	62
F G	10.51	V	33
F G	10.44	PV	48
F G	10.39	PG	48
F G	10.38	G	33
F G	10.37	PG	56
G	10.29	PV	33
G	10.26	PG	33

[1] Means with the same letter are not significantly different.

[2] G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix I. Comparison of mean weight for Hampton Roads, day 69&79, by Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	WEIGHT(lbs.)	POT[2]	DAY
A	13.14	V	79
B	11.91	PV	69
C B	11.89	V	69
C B D	11.22	G	79
C D	10.98	PV	79
D	10.93	G	69
D	10.89	PG	79
D	10.49	PG	69

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix J. Comparison of mean weight for Hampton Roads, day 97, by Tukey's procedure, Alpha = 0.05, n = 7.

GROUPING[1]	WEIGHT(lbs.)	POT[2]
A	12.04	V
B	10.99	PV
B		
B	10.89	PG
B		
B	10.79	G

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix K. Comparison of mean foul scores for Hampton Roads, day 0-26, By Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	SCORE	POT[2]	DAY
A	2.00	V	26
B	0.00	PG	0
B			
B	0.00	PG	19
B			
B	0.00	PG	26
B			
B	0.00	V	0
B			
B	0.00	V	19
B			
B	0.00	G	0
B			
B	0.00	G	19
B			
B	0.00	G	26
B			
B	0.00	PV	0
B			
B	0.00	PV	19
B			
B	0.00	PV	26

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix L. Comparison of mean foul scores for Hampton Roads, day 33-62, by Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	SCORE	POT[1]	DAY
A	3.82	V	62
B	2.91	V	56
B			
C B	2.45	PV	62
C B			
C B	2.36	V	48
C B			
C B	2.27	G	62
C			
C D	2.00	G	56
C D			
C D E	1.81	PV	56
D E			
F D E	1.45	G	48
F D E			
F D E	1.45	PV	48
F D E			
F D E	1.36	V	33
F E			
F E	1.18	PV	33
F			
F	1.00	G	33
F			
F G	0.81	PG	62
G			
H G	0.18	PG	56
H			
H	0.00	PG	33
H			
H	0.00	PG	48

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix M. Comparison of mean foul scores for Hampton Roads, day 69&79, by Tukey's procedure, Alpha = .05, n = 11.

GROUPING[1]	SCORE	POT[2]	DAY
A	3.18	V	79
B	2.45	V	69
B			
B	2.45	PV	69
B			
C B	2.09	G	69
C B			
C B	2.00	G	79
C B			
C B	2.00	PV	79
C			
C	1.82	PG	79
D	1.00	PG	69

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix N. Comparison of mean foul scores for Hampton Roads, day 97, by Tukey's procedure, Alpha = 0.05, n = 7.

GROUPING[1]		SCORE	POT[2]
	A	3.29	V
	A		
B	A	3.14	PV
B	A		
B	A	2.57	PG
B			
B		2.43	G

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix O. Analyses of variance for York River crabpot weights, foul scores, and catch as affected by crabpot type.

Crabpot Weight, day 100

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot	3	19.4777	6.4925	12.48	0.0001	0.4834	6.237
Error	40	20.8137	0.5203		STD DEV		Wt Mean (lb)
Corrected Total	43	40.2915			0.7213		11.565

****

Foul Scores, day 0-100

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = foul score x pot & day	55	526.5818	9.5742	223.26	0.0001	0.9522	20.678
Error	616	26.4167	0.0428		STD DEV		Foul Score Mean
Corrected Total	671	552.9985			0.2071		1.001

****

Catch Volumes, day 8-100

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = catch x pot	3	0.7557	0.2519	0.39	0.7620	0.0257	34.584
Error	44	28.5506	0.6489		STD DEV		Catch Mean (bu)
Corrected Total	47	29.3063			0.8055		2.329

****

Appendix P. Comparison of mean weight for York River, day 100, by Tukey's procedure, Alpha = 0.05, n = 11

GROUPING[1]		WEIGHT (lbs.)	POT[2]
	A	12.41	V
	A		
B	A	11.98	PV
B			
B	C	11.16	PG
	C		
	C	10.71	G

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix Q. Comparison of mean foul scores for York River, day 0-100, by Tukey's procedure, Alpha = 0.05, n = 12

GROUPING[1]	SCORE	POT[2]	DAY
A	3.00	V	79
A			
A	2.92	V	86
B	2.00	PG	65
B			
B	2.00	V	30
B			
B	2.00	V	44
B			
B	2.00	V	51
B			
B	2.00	V	57
B			
B	2.00	V	65
B			
B	2.00	V	72
B			
B	2.00	G	65
B			
B	2.00	G	72
B			
B	2.00	PV	72
B			
B	2.00	PV	86
B			
B	1.92	V	100
B			
B	1.92	PV	100
B			
B	1.92	PV	79
B			
B	1.83	PG	86
B			
C B	1.75	V	93
C B			
C B	1.67	PG	79
C			
C D	1.42	PV	65
D			
E D	1.25	G	79
E D			
E D	1.25	G	86
E D			
E D	1.25	PV	51
E			

Appendix Q - Continued

E F E F	1.00	PG	100
E F E F	1.00	PG	72
E F E F	1.00	PG	93
E F E F	1.00	V	15
E F E F	1.00	V	23
E F E F	1.00	G	100
E F E F	1.00	G	51
E F E F	1.00	G	57
E F E F	1.00	G	93
E F E F	1.00	PV	44
E F F	1.00	PV	93
F	0.75	PV	57
G G	0.25	PV	30
G G	0.00	PG	0
G G	0.00	PG	15
G G	0.00	PG	23
G G	0.00	PG	30
G G	0.00	PG	44
G G	0.00	PG	51
G G	0.00	PG	57
G G	0.00	PG	8
G G	0.00	V	0
G G	0.00	V	8
G G	0.00	G	0
G G	0.00	G	15
G G	0.00	G	23

Appendix Q. - Continued

G G	0.00	G	30
G G	0.00	G	44
G G	0.00	G	8
G G	0.00	PV	0
G G	0.00	PV	15
G G	0.00	PV	23
G	0.00	PV	8

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix R. Analyses of variance for Balls Creek crabpot weights as affected by crabpot type.

Day 0-43

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C.V.
Model = weight x pot & day	23	22.3091	0.9699	47.34	0.0001	0.7908	1.423
Error	288	5.9003	0.0205		STD DEV		Wt Mean (lbs)
Corrected Total	311	28.2094			0.1431		10.056

Day 53-71

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = weight x pot & day	11	20.0823	1.8257	59.56	0.0001	0.8198	1.656
Error	144	4.4141	0.0306		STD DEV		Wt Mean (lbs)
Corrected Total	155	24.4964			0.1750		10.569

Day 78-129

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = weight x pot & day	23	117.3133	5.1006	26.35	0.0001	0.7163	3.987
Error	240	46.4497	0.1935		STD DEV		Wt Mean (lbs)
Corrected Total	263	163.7631			0.4399		11.034

Appendix S. Analyses of variance for Balls Creek foul scores as affected by crabpot type.

Day 0-43

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = foul score x pot & day	23	96.8452	4.2106	70.74	0.0001	0.8390	117.108
Error	312	18.5714	0.0595		STD DEV		Foul Score Mean
Corrected Total	335	115.4166			0.2439		0.208

Day 53-71

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = foul score x pot & day	11	360.0654	32.7332	229.87	0.0001	0.9419	27.927
Error	156	22.2142	0.1424		STD DEV		Foul Score Mean
Corrected Total	167	382.2797			0.3773		1.351

Day 78-129

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model - foul score x pot & day	23	299.1632	13.0071	36.96	0.0001	0.7630	31.235
Error	264	92.9166	0.3519		STD DEV		Foul Score Mean
Corrected Total	287	392.0798			0.5933		1.899

Appendix T. Analyses of variance for Balls Creek catch as affected by crabpot type.

Day 10–43

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.7424	0.2474	1.35	0.2923	0.2025	70.653
Error	16	2.9234	0.1827		STD DEV		Catch Mean (bu)
Corrected Total	19	3.6659			0.4274		0.605

Day 53–71

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.1029	0.0346	0.12	0.9462	0.0428	27.906
Error	8	2.3226	0.2903		STD DEV		Catch Mean (bu)
Corrected Total	11	2.4265			0.5388		1.930

Day 78–129

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	2.0402	0.6800	5.29	0.0075	0.4424	18.841
Error	20	2.5708	0.1285		STD DEV		Catch Mean (bu)
Corrected Total	23	4.6111			0.3585		1.902

Appendix U. Comparison of mean weight for Balls Creek, day 0-43, by Tukey's procedure, Alpha = 0.05, n = 13

GROUPING[1]	WEIGHT (lbs.)	POT[2]	DAY
A	10.76	G	43
A			
A	10.72	V	43
B	10.34	G	36
B			
C B	10.29	PG	43
C B			
C B	10.26	V	36
C			
C D	10.12	PG	26
C D			
C D E	10.11	PG	19
C D E			
C D E	10.10	V	26
C D E			
C D E	10.09	PG	36
C D E			
C D E	10.09	G	26
D E			
D E	10.05	G	10
D E			
D E	10.03	G	19
D E			
D E	10.03	PV	43
D E			
D E	9.98	PV	36
D E			
D E	9.96	PV	26
D E			
F D E	9.95	PG	10
F D E			
F G D E	9.95	PV	10
F G D E			
H F G D E	9.91	V	19
H F G E			
H F G E	9.91	V	10
H F G			
H F G	9.75	PV	0
H F G			
H F G	9.74	V	0
H F G			
H F G	9.74	G	0
H G			
H G	9.74	PG	0
H			
H	9.71	PV	19

[1]Means with the same letter are not significantly different.
[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix V. Comparison of mean weight for Balls Creek, day 53-71, by Tukey's procedure, Alpha = 0.05, n = 13

GROUPING[1]			WEIGHT (lbs.)	POT[2]	DAY
	A		11.36	V	71
	A				
	A		11.22	V	64
	B		10.71	PG	71
	B				
C	B		10.64	V	53
C	B				
C	B	D	10.56	PG	64
C		D			
C	E	D	10.45	G	71
C	E	D			
C	E	D	10.44	PG	53
	E	D			
	E	D	10.38	G	53
	E	D			
	E	D	10.36	G	64
	E	D			
	E	D	10.35	PV	71
	E				
F	E		10.23	PV	64
F					
F			10.12	PV	53

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix W. Comparison of mean weight for Balls Creek, day 78-129, by Tukey's procedure, Alpha = 0.05, n = 11

GROUPING[1]	WEIGHT(lbs.)	POT[2]	DAY
A	13.49	V	129
B	12.02	V	110
B			
C B	11.88	PV	129
C B			
C B D	11.69	V	103
C D			
C E D	11.24	PV	110
E D			
F E D	11.16	V	92
F E D			
F G E D	11.13	PV	103
F G E D			
H F G E D	11.08	PG	92
H F G E			
H F G E	10.98	PG	110
H F G E			
H F G E	10.93	PV	92
H F G E			
H F G E	10.91	PG	129
H F G E			
H F G E	10.87	G	129
H F G E			
H F G E	10.85	PG	103
H F G E			
H F G E	10.85	PG	85
H F G E			
H F G E	10.84	PG	78
H F G E			
H F G E	10.69	G	85
H F G E			
H F G E	10.67	PV	85
H F G E			
H F G E	10.58	G	110
H F G E			
H F G E	10.56	G	92
H F G			
H F G	10.52	G	103
H F G			
H F G	10.51	G	78
H F G			
H F G	10.48	V	78
H G			
H G	10.45	V	85
H			
H	10.39	PV	78

[1] Means with the same letter are not significiantly different.
[2] G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix T. Analyses of variance for Balls Creek catch as affected by crabpot type.

Day 10–43

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.7424	0.2474	1.35	0.2923	0.2025	70.653
Error	16	2.9234	0.1827		STD DEV		Catch Mean (bu)
Corrected Total	19	3.6659			0.4274		0.605

Day 53–71

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	0.1029	0.0346	0.12	0.9462	0.0428	27.906
Error	8	2.3226	0.2903		STD DEV		Catch Mean (bu)
Corrected Total	11	2.4265			0.5388		1.930

Day 78–129

Source	DF	Sum of Squares	Mean Square	F Value	PR > F	R-Square	C. V.
Model = catch x pot	3	2.0402	0.6800	5.29	0.0075	0.4424	18.841
Error	20	2.5708	0.1285		STD DEV		Catch Mean (bu)
Corrected Total	23	4.6111			0.3585		1.902

Appendix Y. Comparison of mean foul scores for Balls Creek, day 53-71, by Tukey's procedure, Alpha = 0.05, n = 14.

GROUPING[1]		SCORE	POT[2]	DAY
	A	4.00	V	64
	A			
	A	4.00	V	71
	B	3.00	V	53
	C	1.93	PG	71
	D	1.07	PG	53
	D			
	D	1.00	PG	64
	D			
E	D	0.71	PV	53
E				
E		0.50	G	53
	F	0.00	G	64
	F			
	F	0.00	G	71
	F			
	F	0.00	PV	64
	F			
	F	0.00	PV	71

[1]Means with the same letter are not significantly different.

[2]G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.

Appendix Z. Comparison of mean foul scores for Balls Creek, day 78-129, by Tukey's procedure, Alpha = 0.05, n = 12.

GROUPING[1]	SCORE	POT2	DAY
A	4.00	V	129
A			
B A	3.17	V	110
B			
B C	3.08	PV	129
B C			
B C D	3.00	V	92
B C D			
B C D	2.92	V	103
B C D			
B E C D	2.75	PV	103
B E C D			
B E C D	2.67	PV	110
B E C D			
F B E C D	2.58	PV	92
F B E C D			
F B E C D G	2.33	PG	129
F E C D G			
F H E C D G	2.25	PG	85
F H E D G			
F H E D G	2.17	PG	92
F H E G			
F H E I G	2.00	PG	110
F H E I G			
F H E I G	1.92	PG	103
F H I G			
F H I G	1.75	PV	85
H I G			
H I J G	1.58	PG	78
H I J			
H K I J	1.42	V	78
H K I J			
H K I J	1.42	V	85
H K I J			
H K I J	1.42	G	129
K I J			
L K I J	1.17	G	110
L K J			
L K M J	0.83	PV	78
L K M			
L K M	0.58	G	103
L M			
L M	0.50	G	92
M			
M	0.08	G	85
M			
M	0.00	G	78

[1] Means with the same letter are not significantly different.
[2] G = galvanize, PG = painted galvanize, V = vinyl, PV = painted vinyl.