Fisheries Research Grant Program Final Report

Submitted to

Fishery Resource Grant Program
Virginia Graduate Marine Science Consortium
170 Rugby Road
Charlottesville, Virginia 22904-4146

Efficiency of Haul-Seine Cull Panels
A Comparison of Size Selectivity and Relative Release
Second Season

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Abstract

In 2001, eight bycatch reduction panels were placed in a haul-seine pocket in order to examine fishes' release. Each panel contained fourteen rings 1 7/8 " in diameter and six 5 1/8 " long and 29/32 " high. The number of rings totaled 112 and slots totaled 48. Release tests were conducted fourteen times from March to November. Study sites were located along the southern shore of the York River and at its mouth where it enters the Chesapeake Bay. Panels allowed 50% of the croaker < 9.6" (245mm), 50% of the flounder < 13.1" " (333mm), 42% of the spot < 7.9 " (200mm), and 60% of the stripers < 10.4 " (265mm) and 40 % of the weakfish < 12.2 " (310mm) that were pocketed to escape. However, very few small croaker were caught and 42% of the undersized flounder, 43% of the undersized spot, 16% of the undersized striped bass and 95% of the undersized weakfish were gilled and thus prevented from panel interaction. Gilling reduced overall release percentages for flounder to 29%, spot to 24% and weakfish to 2%. Statistical analysis of flounder and spot release revealed probabilities of occurrence of < .0005 showing that release of pocketed fishes below specified sizes was highly significant. Croaker and striped bass were not statistically examined due to small sample sizes. The study shows that release panels can reduce culling effort by passively releasing sub-marketable fishes, thus improving catch per unit effort, without profit loss.

Introduction

As a result of the passage of the Magnuson-Stevens Fishery Conservation and Management Act (MCFCMA) of 1996, laws exist to protect the fisheries against overfishing through management for sustainability. Often a significant portion of the mortality due to fishing (F) is the result of bycatch. One of the major factors contributing to a gear's bycatch is the size distribution of fishes present and the nature of the gear's operation. In the Chesapeake Bay, fish sizes and populations are often driven by environmental fluctuations that are not easily predictable. The other major factor, gear selectivity, can be addressed and often improved. Gear alteration is relatively simple and can often drastically affect the quantity of sub-marketable fishes impacted and/or retained. Performance of alterations can be tested and refined over time to maximize such fishes release.

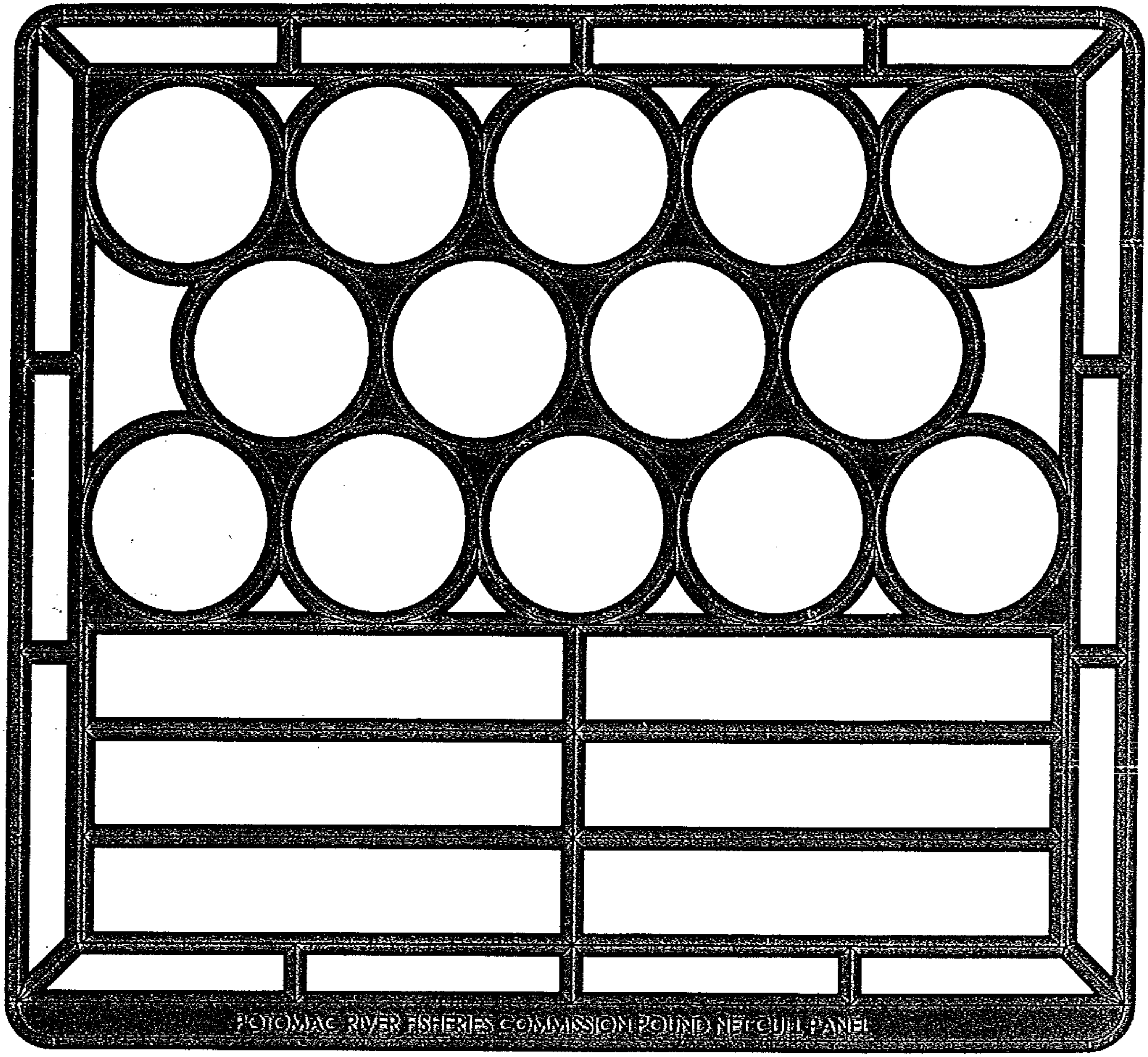
Haul-seines impact large numbers of juvenile fishes in the Virginia waters of the Chesapeake Bay. This has been recognized somewhat by VMRC and the gear and methods regulated in an effort to reduce juvenile mortality. Unfortunately, these modifications were based on theoretical bycatch percentages and anecdotal statistics. Basing bycatch-per-unit-effort (BPUE) on such data can lead to serious miscalculations in total mortality due to fishing (F).

While seines have been operated in the Chesapeake Bay since colonial times, haul-seining is the only commercial method that survives today. Like all of the other modern commercial methods, haul-seiners have been forced, due to shrinking resources and stiffened regulations, to revaluate the impact of their gear. This study was conducted in order to determine if the bycatch reduction panels currently being produced by the Potomac River Fisheries Commission can significantly reduce the number of sub-marketable fishes being taken by haul-seines and determine if this reduction can aid fishermen by decreasing culling effort.

Methods

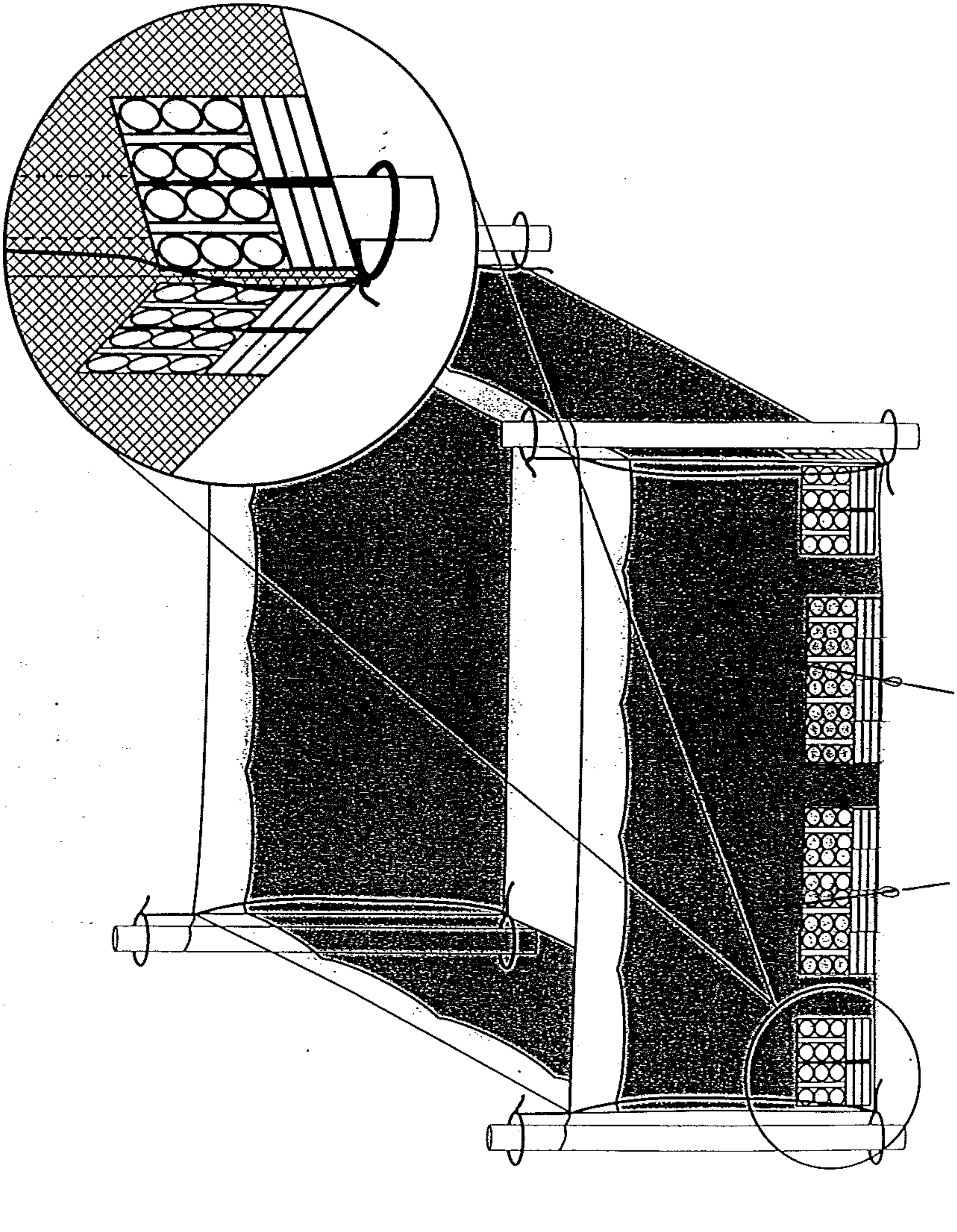
Study sites were located on the southern shores of the York River near its mouth and junction with the Chesapeake Bay. The benthos contained mobile macro-algae, submerged aquatic vegetation, mud and sandbars. Approximately 80,500 m^2 of water were fished each time. The net was set on a high tide and the tide allowed to drop before it was swept back and fished. This method reduced gear stress when heavy grass and algae were present. Fourteen seine sets were run from 4/3/00 to 11/19/00 and every set was successful in that it caught fishes.

A modified haul-seine pocket was constructed so that it allowed for recapture of escaping fishes. Eight panels were used and each panel contained fourteen 1 $^{7/8}$" diameter rings and six 5 $^{1/8}$" long X 29/32" high slots (fig 1). The number of rings totaled 112 and slots totaled 48. Two panels were placed at right angles to one another in the two corners opposite the lead line. The other


POTOMAC RIVER FISHERIES COMMISSION POUND NET CULL PANEL

four panels were sewn in as sets of two, an equal distance from each other and the corner panels. These sets were then anchored from their centers to small poles via a rope loop. This tension formed a funnel that culminated at the panel's junction (fig 2). Under normal commercial conditions, eight panels would be placed in each of the pocket's four corners. This placement was not possible in this experiment due to the need for recapture and measurement of all escaping fishes.

Recapture was accomplished by a second pocket that surrounded all the panels exiting the experimental pocket. Measurements from these fishes and those escaping the same size rings and slots used in the Potomac in 1998 were used to determine the largest fish of each species capable of using the panels (Hager 1998). A top line stretched tight and secured to external pocket poles separated the pockets and prevented alternate passage.



Results

Cruise	Species	Total	Gilled	Potential Releases	Released	% From Pocket	% Total Fish
42501	Croaker	91	na	0<245	0	0	
51001	Croaker	4277	na	0<245	0	0	
52501	Croaker	2440	na	1<245	1	100	
61201	Croaker	3730	0<245	0<245	0	0	
61901	Croaker	41	0<245	0<245	0	0	
71001	Croaker	3546	na	0<245	0	0	
72501	Croaker	1680	na	0<245	0	0	
82801	Croaker	481	na	0<245	0	0	
91801	Croaker	5	na	1<245	0	0	
92501	Croaker	5	0<245	0<245	0	0	
TOTALS			na			50% Av.	50% Av.
42501	Flounder	1	na	0<333	0	0	
51001	Flounder	3	na	0<333	0	0	
52501	Flounder	11	na	2<333	2	100	
61201	Flounder	2	0<333	0<333	0	0	
71001	Flounder	11	3<333	5<333	2	40	
72501	Flounder	9	5<333	4<333	3	75	
82801	Flounder	5	1<333	1<333	0	0	
91801	Flounder	5	2<333	1<333	0	0	
92501	Flounder	8	0<333	4<333	2	50	
100901	Flounder	5	2<333	1<333	0	0	
TOTALS			42% Gilled			50% Av.	29% Av.
42501	Spot	1	na	0<200	0	0	
51001	Spot	422	14<200	28<200	14	50	
52501	Spot	386	87<220	87<200	5	6	
61201	Spot	279	14<200	17<200	6	35	
61901	Spot	35	na	0<200	0	0	
71001	Spot	610	3<200	9<200	0	0	
72501	Spot	629	34<200	41<200	24	59	
82801	Spot	288	na	230<200	106	46	
91801	Spot	174	136<200	13<200	0	0	
92501	Spot	296	75<200	62<200	50	80	
100901	Spot	71	7<200	6<200	0	0	
TOTALS			43% Gilled			42% Av.	24% Av.
41201	Striped Bass	11	na	0<265	0	0	
42501	Striped Bass	1	na	0<266	0	0	

51001	Striped Bass	91	na	0<265	0	0	
52501	Striped Bass	16	na	0<265	0	0	
61201	Striped Bass	45	na	0<265	0	0	
71001	Striped Bass	24	0<265	4<265	3	75	
72501	Striped Bass	37	1<265	1<265	0	0	
82801	Striped Bass	5	na	0<265	0	0	
92501	Striped Bass	1	na	0<265	0	0	
100901	Striped Bass	750	na	0<265	0	0	
103001	Striped Bass	9	na	0<265	0	0	
111901	Striped Bass	43	na	0<265	0	0	
TOTALS			16% Gilled			60% Av.	50% Av.
51001	Weakfish	36	6<310	0<310	0	0	
52501	Weakfish	10	5<310	0<310	0	0	
61201	Weakfish	8	5<310	0<310	0	0	
61901	Weakfish	1	na	0<310	0	0	
71001	Weakfish	39	9<310	0<310	0	0	
72501	Weakfish	37	12<310	3<310	1	33	
82801	Weakfish	9	na	0<310	0	0	
91801	Weakfish	72	24<310	0<310	0	0	
92501	Weakfish	64	33<310	2<310	1	50	
100901	Weakfish	8	2<310	0<310	0	0	
111901	Weakfish	19	9<310	0<310	0	0	
TOTALS			95 % Gilled			40% Av.	2% Av.

Gizzard shad that have no market value made up by far the greatest mass and number of all species taken. Fish sizes above indicate the largest fish recorded using the rings and/or slots.

Statistical Analysis

The Jack-knife method of statistical analysis relies on no assumptions. This method of analysis operates under the null hypothesis that nothing unusual is going on. If this were true, panels would allow all fishes an equal opportunity of escape; they therefore would not discriminate against some fishes based upon size. Jack-knife analysis first requires that the size composition of the catch is known and recorded. This known catch is then sampled repetitively. Each time the number of released fish for each species is selected randomly from the whole catch of that species. Catch composition containing fishes above and below releasable sizes are repeatedly recorded. After enough samples of this number have been selected, the odds of any given number of fish below a specified size being released is determined.

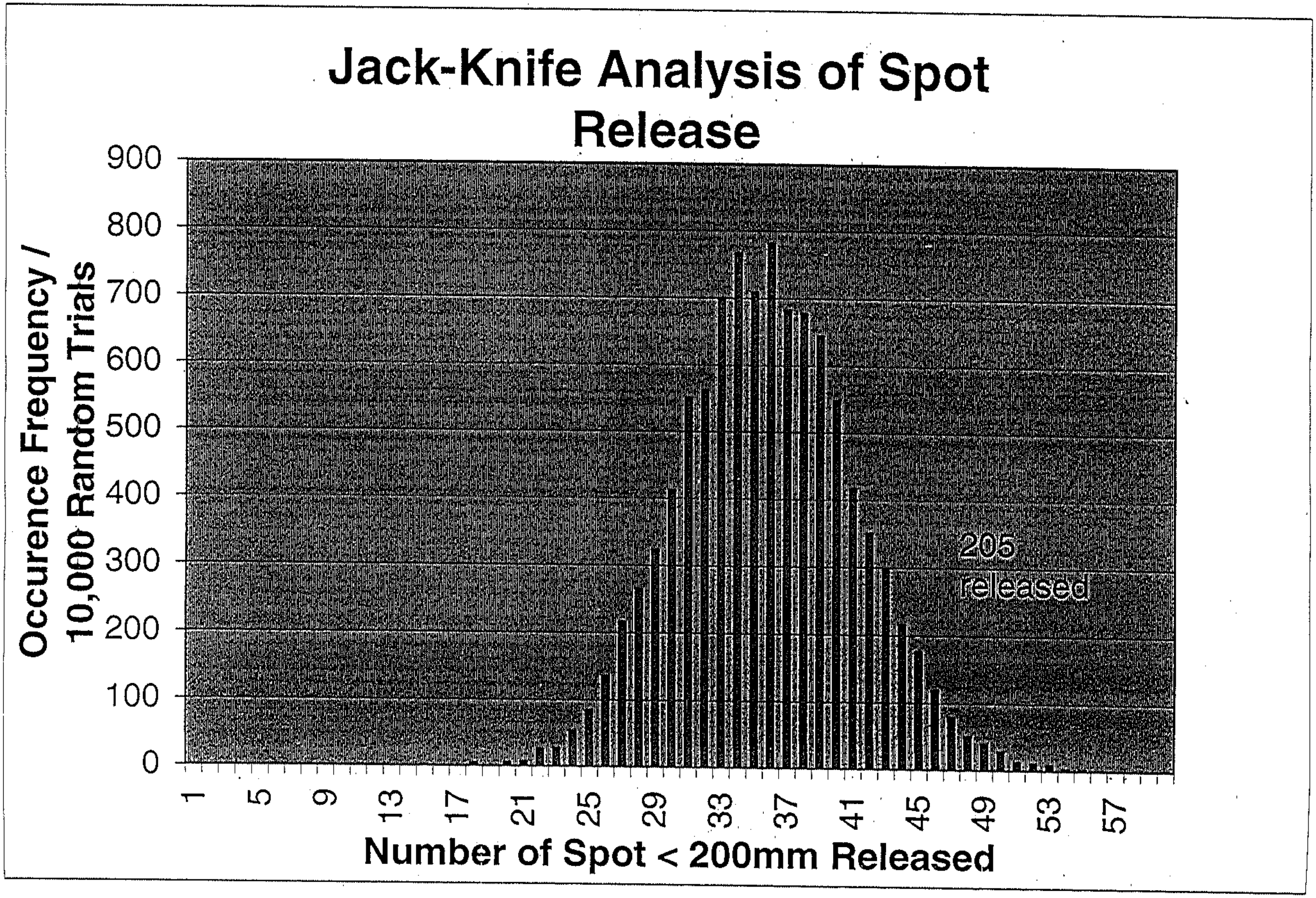
The results are plotted and the graph shows how often each number would naturally occur given the total catch composition and 10,000 occurrences if the null held true. By comparing the number of fish below a specified size that were released during the study to the graph's distribution of possible outcomes, one can determine how unusual each study's results were. Repeating the process 10,000 times elicits a significance of occurrence that is sensitive to 1/10,000 or .0001.

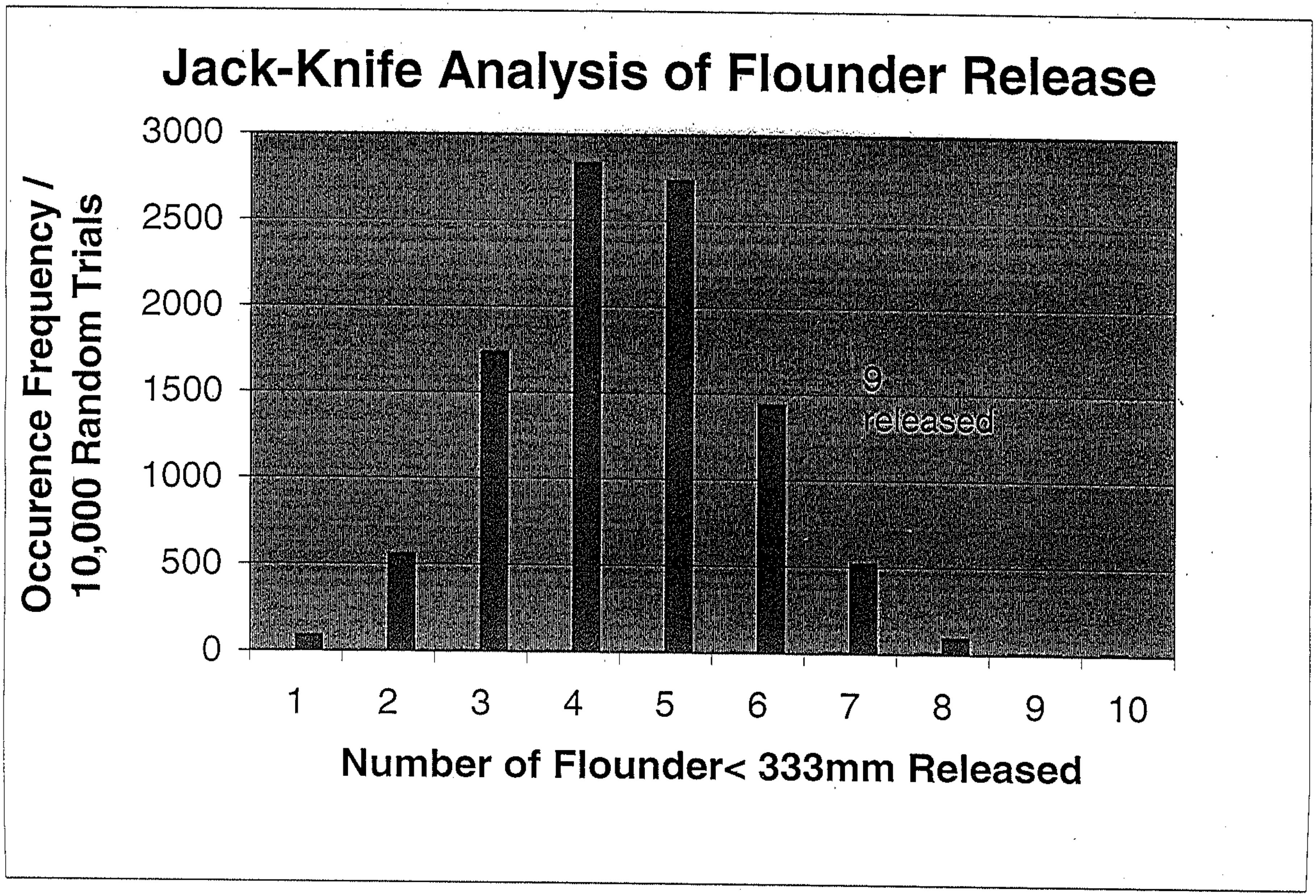
Over 21,000 croaker, flounder, spot, striped bass, and weakfish were captured during the study, however only spot and flounder occurred in large enough numbers in the pocket to justify a statistical examination. The following graphs demonstrate Jack-knife analysis of spot and flounder release, both were highly significant with a probability of occurrence of < .0001 (graph 1 and 2).

Discussion

Release of undersized pocketed fishes is significant. Panels allowed 50% of the croaker < 9.6" (245mm), 50% of the flounder < 13.1" " (333mm), 42% of the spot < 7.9 " (200mm), and 60% of the stripers < 10.4 " (265mm) and 40 % of the weakfish < 12.2 " (310mm) that were pocketed to escape. However, very few small croaker were caught and 42% of the undersized flounder, 43% of the undersized spot, 16% of the undersized striped bass and 95% of the undersized weakfish were gilled before they could reach the panels. High gilling rates are in agreement with Meyers who found that 3" mesh gilled over 65% of the weakfish from 10.6-12.2"(270-310mm) and over 80% of the fish >12.2" (>310) (1973). Gilling significantly reduced possible release of smaller fishes in every case, but croaker because no small fishes were encountered.

When all fish below a specified size that interacted with the gear are included, the panels released 29% of the flounder, 24% of the spot and 2% of the weakfish. Weakfish release is reduced the most because very few <12.2" ever make it to the pocket. No legal fishes were ever released. Statistical analysis of


Jack-Knife Analysis of Spot Release
Occurence Frequency / 10,000 Random Trials
900
800
700
600
500
400
300
200
100
0
1
5
9
13
17
21
25
29
33
37
41
45
49
53
57
205 released
Number of Spot < 200mm Released


Jack-Knife Analysis of Flounder Release
Occurence Frequency / 10,000 Random Trials
3000
2500
2000
1500
1000
500
0
1
2
3
4
5
6
7
8
9
10
Number of Flounder< 333mm Released
9 released

flounder and spot release revealed probabilities of occurrence of < .0001. Croaker and striped bass were not statistically examined because few fish of releasable size were encountered but their percentages of release were promising. Panel use may significantly reduce culling effort of pocketed fishes without profit loss, however, due to the mobile nature of the gear and current mesh size requirements a large percentage of these fishes are gilled before they are pocketed.

Bibliography

Hager, C.H., 2000. Efficiency of Pound-net Cull Panels for the Release of Weakfish and Summer Flounder. MA thesis, School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Va., 45 p.

Meyers, H.L., 1973. Retention and escape characteristics of pound nets as a function of pound-head mesh size. MA thesis, School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Va., 25 p.

Expenditures to Date

ITEM / CATEGORY	AMOUNT
a. Personnel Costs (time x unit cost)	
3 Deckhands: (14 days x 20 hrs) @ $10/hour	$8400
First mate: (14 days x 20 hrs) @ $12/ hour	$3360
Field chief: (14 days x 20 hrs) @ $14/hour	$3920
Data analysis and presentation: 30 hrs @ $18/hour	$540
Net mending (very time consuming)	FREE
b. Travel (trip or mileage x unit cost)	
Field work: (14 days x 60 miles roundtrip) @ $.325	$273
Presentation: (350 miles roundtrip) @ $.325	FREE
Hotel: 2 nights @ $55 each	FREE
c. Supplies	
Oil / gas: 14 days @ $80 (included in seine fee)	
Food for crew: 14 days @ $25	$350
d. Equipment (items more than $500)	
Nets were used and bought from Bobby Brown	

(200 ft long x 10' tall x 1.5 inch bar)	$550
Second pocket	$200
P.R.F.C. panels (10 of them)	FREE

e. Contractual Services (itemized):

14 hauls @ $520 a haul (note Gas price change)	$7280
Haul-seine pocket modifications:	$700

f. Other costs:

Printing and presentation materials	$200
Shipping:	$100

g. Total project cost: <u>$25,873</u>

<u>Predicted cost: $16,496</u>