*ACCOMAC AQUA-FARMS*
*P/O 273 Accomac Va. 23301*
*(757) 787-3757*
HASP # VA-1197 SS
Farm raised shellfish

Final Report Statement
**Artificial Reef Grow-Out**
**#RG-99-34**
**(Jeff Hammer)**

The purpose of this project, was to address the possibility of improving upon the current grow out procedures currently being used by the oyster aquaculture industry. I.e. Taylor floats - Rack and bag

As stated in the proposal, the current adopted method of raising oysters is to use Taylor floats. This method has proven to be effective in producing market sized oysters in 1- 2 years, although intensive labor cost and high fouling rates decrease profit margins considerably. Also the availability of suitable sites is now under increased regulations and is not welcomed in some waterfront communities.

My proposal was to evaluate a new and novel grow-out technique. By placing nursery grown seed into a contained area whose seabed had been raised with the addition of oyster shells to a height of 6-8" above the surrounding areas it was presumed that the animals would grow to market size in a acceptable amount of time and require less maintenance, thus increasing profit margins by reducing labor.

Weekly monitoring of the nursery site was performed, as well as Quarterly sampling and data collection of the plots. P.G. Ross of V.I.M.S. and myself have prepared growth rate and mortality graphs. Also a pathology report was included in our studies,

## SUMMARY

**Advantages:** This project has proven that oysters can be grown in these contained plots without the risk of high mortality due to predators. The formation of silt, was sum what troublesome at times. We found that by applying water pressure at mid-tide, this was easily solved . Labor was greatly reduced as compared to Taylor floats. A very good strike of natural oysters has now attached themselves to the surrounding containment system. I feel that this system of grow out has the potential for future development.

**Disadvantages:**

The locations that were chosen seemed to have to large a population of native oysters that were harboring the Dermo disease. Hence it was passed on to the project oysters at an early stage, as evident in the following reports. Mortality rates were unacceptably high due to the Dermo. Pathology reports indicate an infection of up to 90%. The remaining live animals will be retested for disease in the fall of 2002, these may prove to be resistant to dermo and will be used as future brood stocks

**Future benefits;**

If the scientific community ever develops a oyster that will be tolerant of the diseases now infecting the entire Chesapeake bay region, this method of grow out will be of great importance.
Furthermore if the introduction of araikinsis were allowed, this would be a very safe and contained system for the grow-out of this disease resistant animal. I feel that many questions were answered by this project. It is now evident that by reducing the labor involved, you also reduce the speed at which the animals grow. In our current environment it seems that speed of growth may be more important to survival

# Artificial Reef Growout
# Fisheries Grant Project #RG-99-34
# (Jeff Hammer)

## Results Summary

*Prepared by P.G. Ross, VIMS-Eastern Shore Lab*

### Oyster Growth

Table 1 summarizes mean shell height and associated variance measures for this project. During the study, oysters grew from ~50 mm to ~61 mm on average, exhibiting typical seasonal growth patterns (Figure 1). Oysters grew significantly better on the East Rock vs. the West Rock, however, trends were similar (Figure 1). Figure 2 illustrates the size frequency distribution (%) for both rocks combined during 2001. On 4/9/01, 9/21/01 and 11/2/01 the percentage of market sized oysters (i.e. >75 mm) were 5%, 14.6% and 11.8%, respectively. The low latter number is likely a result of size specific disease related mortality (see next section).

### Oyster Mortality

Table 2 summarizes mortality counts taken during the course of the study. High initial mortality during the December 2000 sample measured nursery mortality, as both live and dead oysters were stocked into grow-out bins because the added substrate was deemed useful. Subsequent mortality estimates are cumulative from this point, including the nursery mortality. Only mortality occurring after oysters were stocked to grow-out were used for graphs. Cumulative mortality after entering the grow-out system ranged from 20.9-25.6% and did not differ statistically between rocks (Figure 3). Additionally, most of this mortality occurred after April 2001 (Figure 3). Oysters at both locations have high "Dermo" disease loads, ranging from 80-90% infection rates with over 20% of oysters exhibiting "Heavy" loads (Figure 4). The timing of the majority of mortality combined with documented disease loads point to disease as the primary mortality factor.

Table 1

Jeff Hammer, Hummocks 2000/2001

Grow-out Project

Oyster growth (shell ht. mm)

| | West Rock | | | East Rock | | |
|---|---|---|---|---|---|---|
| Date | Mean | SD | SE | Mean | SD | SE |
| 9/11/00 | 49.16444 | 9.38238 | 0.989 | 52.23778 | 11.36542 | 1.198 |
| 12/11/00 | 53.98 | 10.74824 | 1.133 | 56.01111 | 9.691598 | 1.022 |
| 4/9/01 | 53.77333 | 10.7377 | 1.132 | 58.71222 | 9.883283 | 1.042 |
| 8/21/01 | 63.29556 | 12.06015 | 1.271 | 66.06444 | 9.847812 | 1.038 |
| 11/2/01 | 60.42444 | 9.221827 | 0.972 | 66.35222 | 12.84894 | 1.354 |

# Figure 1 - Hammer Grant Project

## Mean Shell Ht. (mm)

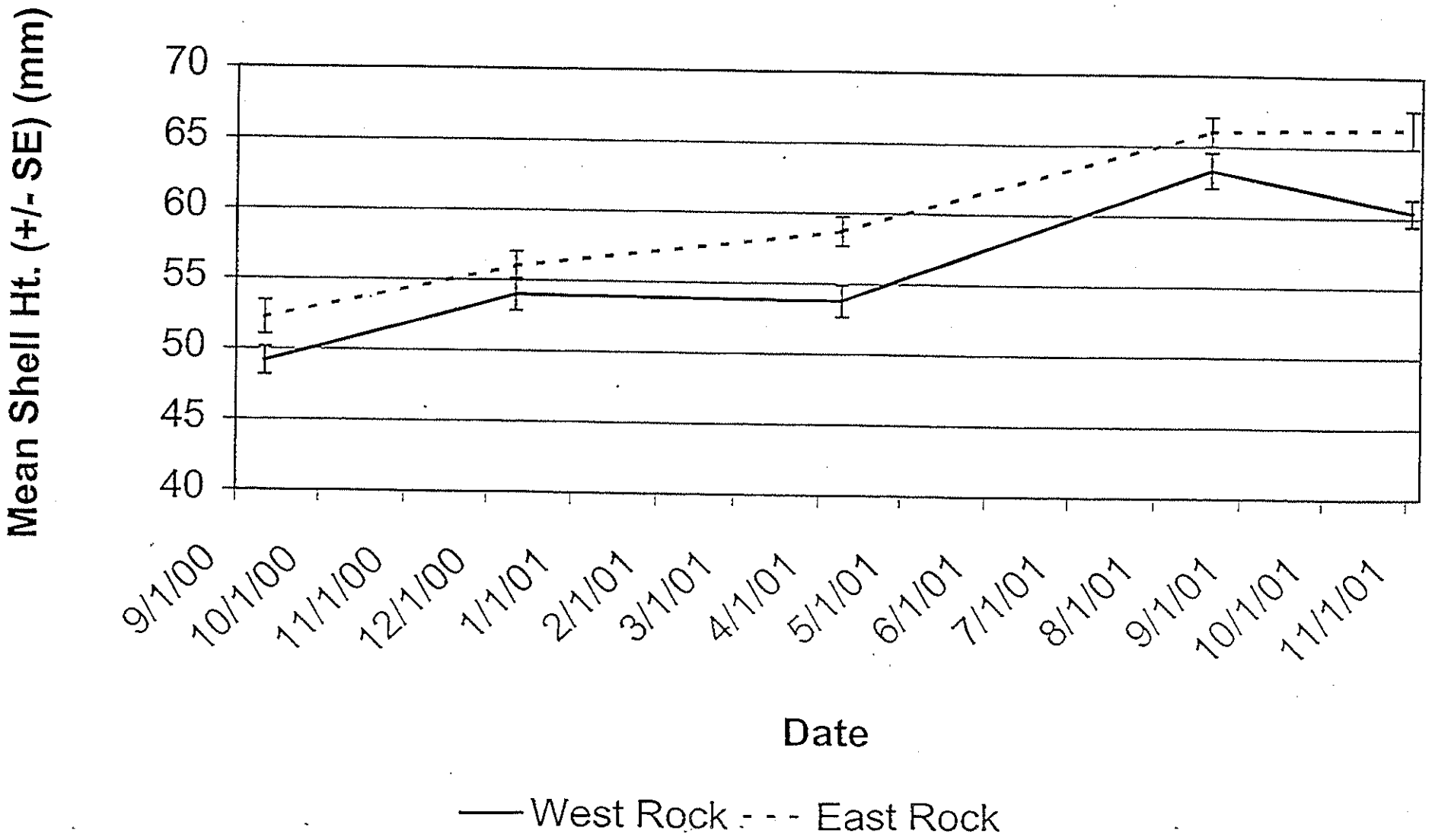
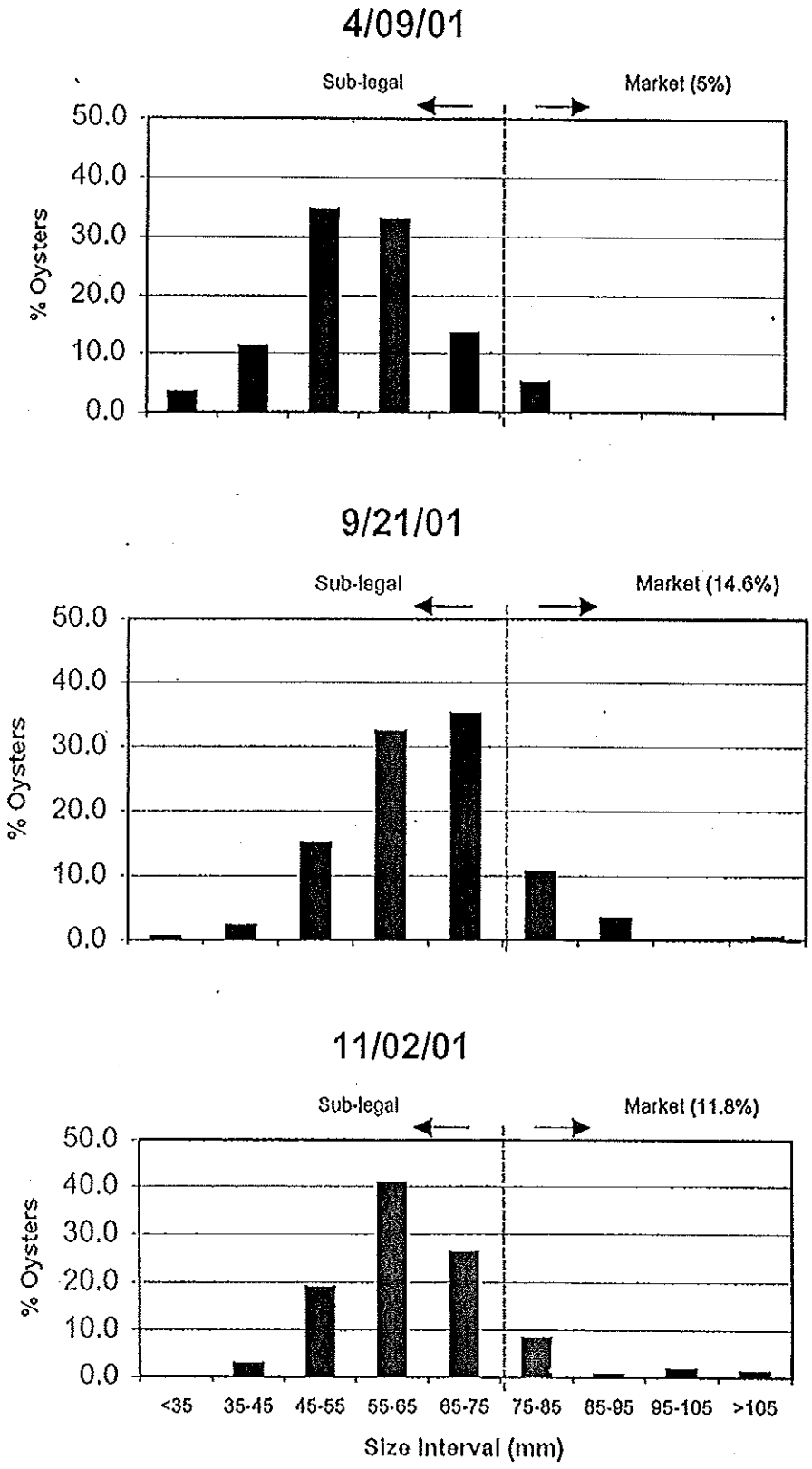


Figure 2. Size frequency distribution of oysters from both East and West rocks combined over time.



# Table 2

## Jeff Hammer, Hummocks 2000
## Grow-out Project

1,2 & 3 are the west rock location (WR)

4,5 & 6 are the east rock/tump location (ER)

### Oyster Mortality

| | | | | Sample 1 (per 0.0625 $m^2$) | | Sample 2 (per 0.0625 $m^2$) | | Sample 3 (per 0.0625 $m^2$) | | Total (per 0.1875 $m^2$) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Location | Trt | Rep | Live | Dead | Live | Dead | Live | Dead | Live | Dead | % Mortality |
| 12/11/2000 | WR | SHELL | 1 | 39 | 11 | 34 | 21 | 94 | 20 | 167 | 52 | 23.7 |
| 12/11/2000 | WR | SHELL | 2 | 34 | 18 | 48 | 17 | 67 | 27 | 149 | 62 | 29.4 |
| 12/11/2000 | WR | SHELL | 3 | 45 | 17 | 40 | 27 | 37 | 8 | 122 | 52 | 29.9 |
| 12/11/2000 | ER | SHELL | 4 | 47 | 8 | 29 | 10 | 21 | 12 | 97 | 30 | 23.6 |
| 12/11/2000 | ER | SHELL | 5 | 37 | 22 | 22 | 8 | 27 | 12 | 86 | 42 | 32.8 |
| 12/11/2000 | ER | SHELL | 6 | 42 | 14 | 15 | 7 | 46 | 12 | 103 | 33 | 24.3 |
| 04/09/2001 | WR | SHELL | 1 | 11 | 7 | 60 | 20 | 41 | 24 | 112 | 51 | 31.3 |
| 04/09/2001 | WR | SHELL | 2 | 25 | 11 | 23 | 14 | 34 | 16 | 82 | 41 | 33.3 |
| 04/09/2001 | WR | SHELL | 3 | 19 | 6 | 17 | 9 | 23 | 33 | 59 | 48 | 44.9 |
| 04/09/2001 | ER | SHELL | 4 | 12 | 13 | 6 | 17 | 53 | 19 | 71 | 49 | 40.8 |
| 04/09/2001 | ER | SHELL | 5 | 18 | 14 | 11 | 11 | 53 | 19 | 82 | 44 | 34.9 |
| 04/09/2001 | ER | SHELL | 6 | 16 | 5 | 32 | 13 | 78 | 21 | 126 | 39 | 23.6 |
| 11/02/2001 | WR | SHELL | 1 | 26 | 24 | 10 | 20 | 9 | 10 | 45 | 54 | 54.5 |
| 11/02/2001 | WR | SHELL | 2 | 4 | 10 | 12 | 14 | 17 | 11 | 33 | 35 | 51.5 |
| 11/02/2001 | WR | SHELL | 3 | 7 | 15 | 21 | 19 | 14 | 15 | 42 | 49 | 53.8 |
| 11/02/2001 | ER | SHELL | 4 | 17 | 18 | 20 | 16 | 29 | 18 | 66 | 52 | 44.1 |
| 11/02/2001 | ER | SHELL | 5 | 20 | 20 | 11 | 11 | 18 | 18 | 49 | 49 | 50.0 |
| 11/02/2001 | ER | SHELL | 6 | 9 | 12 | 19 | 13 | 12 | 14 | 40 | 39 | 49.4 |

NOTE: Initial mortality measures nursery mortality as both live and dead oysters were stocked to bins because the added substrate was deemed useful. Subsequent mortality estimates are cumulative, INCLUDING nursery mortality. For graphs and discussion, only mortality occuring after oysters stocked to grow out were used!

WILLIAM&MARY
VIMS
Virginia Institute of Marine Science
School of Marine Science
Department of Fisheries Science

# SHELLFISH PATHOLOGY REPORT

Source of animals: Jeff Hammer
P.O. Box 273
Accomac, VA 23301

History/Sample ID: Industry West
Location: Burton Bay
Date Collected: August 23, 2001
Date Received: August 28, 2001
Case number: 396
Number of animals processed for histology sample: 25
Number of animals examined using fluid thioglycollate culture: 25

1. Gross description of animals:
No gross pathological signs evident.

2. Histological Findings:
Parasites

| Group | Prevalence | Infection intensity (H-M-L)* |
|---|---|---|
| Bacteria | 0% | |
| Protozoa | | |
| *Haplospoidium nelsoni* (MSX) | 0% | |
| *Perkinsus marinus* (Dermo) | 23/25 (92%) | 6-4-13 |

H=heavy, M=moderate, and L=light

3. Summary:
Ninety-two percent of the oysters examined were infected with *P. marinus*. The majority of *P. marinus* infections were light; however, ten individuals had moderate to heavy infections. No other known disease agents, or other parasites were observed in the oysters.

4. Comments:; Some *P. marinus* associated mortality may occur in the oyster population. Records of the diagnoses will be retained in our laboratory if you need them for any other reason.

Pathologist: Lisa M. Ragone Calvo

September 5, 2001

cc: Eugene Burreson
Mark Luckenbach
William DuPaul

PO Box 1346 • Route 1208 Greate Road • Gloucester Point, Virginia 23062-1346 USA
804/684-7352 • FAX 804/684-7045

WILLIAM & MARY
VIMS
Virginia Institute of Marine Science
School of Marine Science

Department of Fisheries Science

# SHELLFISH PATHOLOGY REPORT

Source of animals: Jeff Hammer
P.O. Box 273
Accomac, VA 23301

History/Sample ID: Industry East
Location: Burton Bay
Date Collected: August 23, 2001
Date Received: August 28, 2001
Case number: 397
Number of animals processed for histology sample: 25
Number of animals examined using fluid thioglycollate culture: 25

1. Gross description of animals:
No gross pathological signs evident.

2. Histological Findings:
Parasites

| Group | Prevalence | Infection intensity (H-M-L)* |
|---|---|---|
| Bacteria | 0% | |
| Protozoa | | |
| *Haplospoidium nelsoni* (MSX) | 2/25 (8%) | 0-1-1 |
| *Perkinsus marinus* (Dermo) | 20/25 (80%) | 6-2-12 |

H=heavy, M=moderate, and L=light

3. Summary:
Eighty percent of the oysters examined were infected with *P. marinus* and 8% were infected with *H. nelsoni*. Infection intensities of *H. nelsoni* were light and moderate. The majority of *P. marinus* infections were light; however, eight individuals had moderate to heavy infections. No other known disease agents, or other parasites were observed in the oysters.

4. Comments: Some *P. marinus* associated mortality may occur in the oyster population. Records of the diagnoses will be retained in our laboratory if you need them for any other reason.

Pathologist: Lisa M. Ragone Calvo

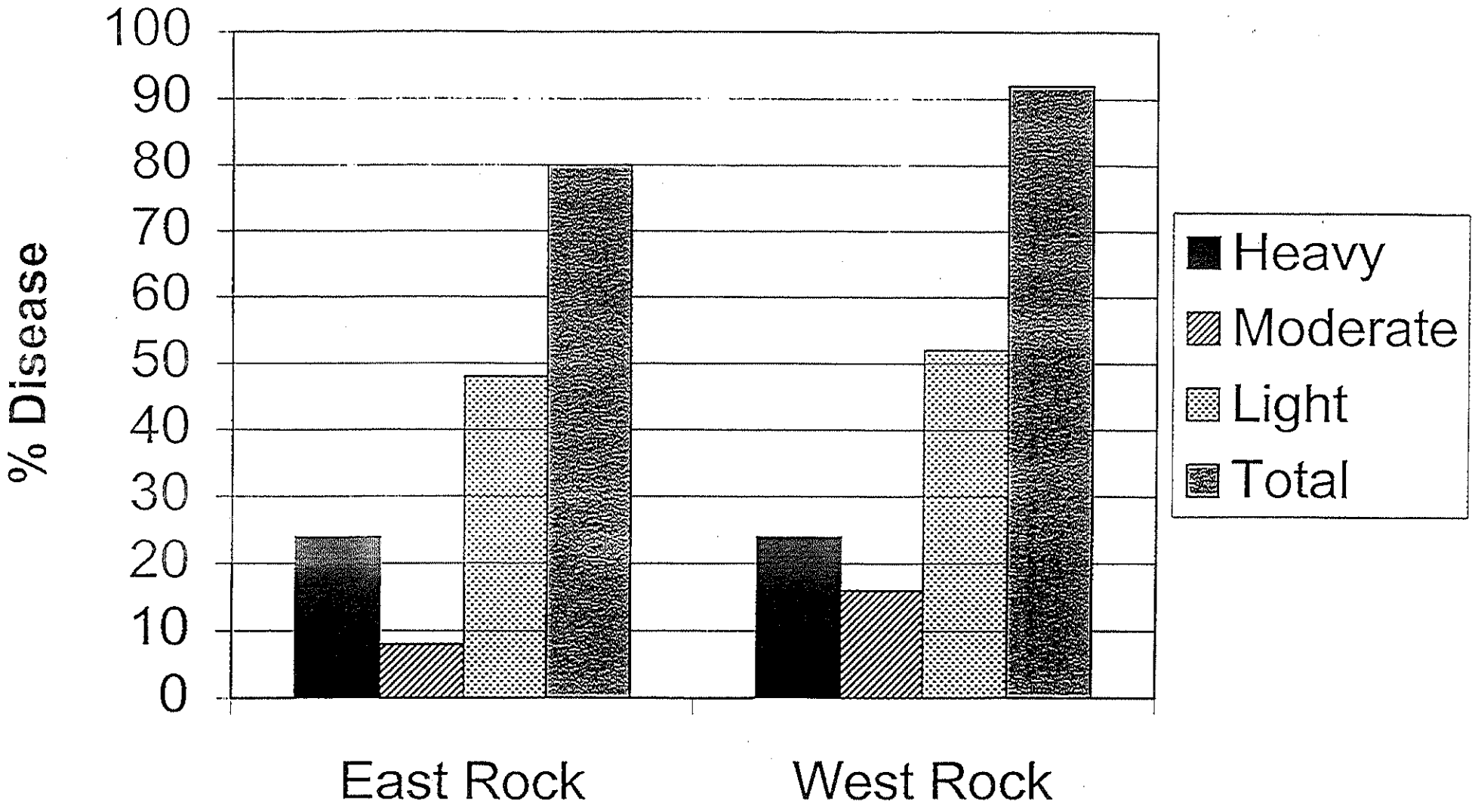
September 5, 2001

cc: Eugene Burreson
Mark Luckenbach

PO Box 1346 • Route 1208 Greate Road • Gloucester Point, Virginia 23062-1346 USA
804/684-7352 • FAX 804/684-7045

# Figure 4 - Hammer Grant Project

## % "Dermo" Disease Load-Aug. 2001



# Figure 3 - Hammer Grant Project

## Cumulative % Mortality after Entering Grow Out