Recommended two year financial budget prepared by the Department of Fisheries and Oceans, Financial Management, for investors interested in lobster farming off the coast of Nfld

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Mr. Alex Faseruk
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Faculty of Business Administration
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St. John's, Newfoundland
A1B 3X5

n/c from
Ron Montaruli (Co-op student)

Work Term III
Faculty of Business
Memorial University of Newfoundland

August 7, 1987

Submitted to Doyle Rose

August 7, 1987

Mr. Alex Faseruk
Finance Professor
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Memorial University of Newfoundland
St. John's, Newfoundland
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Dear Mr. Faseruk;

Enclosed you will find my third work term report. This report has identified the proper monetary and operational requirements necessary for the success of a new venture in lobster farming.

The report is constructed on hypothetical circumstances that determine optimal markets, marketing periods, financial requirements, and production limits.

I hope this report is as interesting for you to read as it was for me to prepare. If you have any questions about this report, please feel free to call me at 772-2042.

Sincerely,

Ron. R. Montaruli
Financial Management

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ABSTRACT

A promising venture in lobster farming for the immediate future would be taking commercially captured lobsters through one or two molts. This would in turn, increase the market value per unit weight, as well as increase the total weight. Marketing at optimal times of the year would obtain the best possible return for effort expended.

With the financial aid of both Federal and Provincial Governments or the availability of large capital investments and Fisheries and Ocean's permission to land "canner" size lobsters off the coast of Newfoundland would make this project economically feasible and increase aquaculture awareness and importance to both the Newfoundland people and government.

INTRODUCTION

Man has been harvesting the sea since the beginning of time. But it has often been a risky and unpredictable venture. Time has come to a point where man can decrease the risk of the sea and farm the seas in much the same manner we have farmed the land.

By the year 2000, more than half of all fish and crustaceans we eat will be farmed. Aquaculture has offered new opportunities to Canadians to maximize the economic and social benefits of the natural resource industry.

The American lobster, Homarus americanus, is distributed along the east coast of North America from Labrador to North Carolina. It is most abundant in Maine, southern Nova Scotia, and the southern Gulf of St. Lawrence. Yearly catches are decreasing steadily and legal carapace lengths are increasing creating a lack of supply for a growing world demand.

The Newfoundland lobster is considered among buyers as the best grade lobster available. With proper fishing restrictions and increased lobster farming, the Newfoundland fisherman can enjoy greater profits for a greater period of time.

Researchers have come up with a one-molt-lobster-culture technique which has definite potential for commerical application in the immediate future. The eyestalk ablation technique is useful for accelerating the growth rate of American lobsters for commercial culture. In the wild, lobsters are relatively slow growing and take five to seven years to reach market size (carapace length 8.1 cm). Researchers interested in lobster farming have been attempting to reduce the growth time, Huges et al. (1972) producing several market size lobsters from eggs in about two years using elevated water temperatures. The mortality rate was unfortunately too high to make it economically feasible.

With improved nutritional diets was improved survival and accelerated growth rates of ablated lobsters which lead us to the conclusion that there is potential for commerical application for this technique. In Canada, approximately 1/3 of the lobsters landed are "canner" sized, carapace length 6.4-8.1 cm. This size lobster receives the lowest market return per unit weight. If a portion of these lobsters can be ablated, one could foresee in the very near future the establishment of a relatively simple lobster culture industry. This paper is a report on a venture to raise "canner" to "market" size lobsters by the eyestalk ablation procedure.

I. FEED

Diets are prepared with inexpensive raw materials which can be produced for large scale commercial lobster cultures. Cooked lobster bodies obtained from a lobster cannery are passed through a meat grinder, frozen in 10 kg blocks, glazed, and stored at-40°C in plastic bags until mixed into the diets. Whole rock crab (Cancer irroratus) is cooked, ground and frozen in the same manner as mentioned previously. Mussels (Mytilus edulis) are steamed to remove the meats, which are then frozen in 10 kg blocks. Whole sea urchins (Stronglylocentrotus droehbachiensis), are steamed, ground, and stored like the crab and lobster bodies.

Fresh diets are prepared each month according to the formulae in Table 1. The frozen ingredients are partially thawed and mixed by passing them through a Hobort meat chopper. The remaining ingredients are added and the mixture is passed through the meat chopper once again. The food is autoclaved for about 30 minutes at 121°C and 15 psi. The feed is chilled to allow it to gel and is cut into pieces approximately 4x2x2 cm. The feed is then stored frozen in plastic bags.

Alternative diets are available in Appendix I. It should be noted that nutritional value of the diet used is of great importance, the final outcome of the project will rely heavily on the quality of the diet consumed by the ablated lobsters.

TABLE 1. DIET FORMULATIONS AND COMPOSITIONAL ANALYSIS.

Ingredient	Percentage used in Diet 1	Diet 2
Lobster Body	20	17
Crab	25	20
Sea Urchin	20	15
Mussel Meat	20	15
Fish Meal[d]	8	20
Gelatine	5	5
Agar[e]	2	2
Fish Oil[d]	..	5
Vitamin Mix[f]	..	1
	Analysis of Diets[c]	
Moisture	53.0 ± 3.1	46.1 ± 0.7
Protein[a]	24.6 ± 0.6	22.5 ± 1.8
Lipid	1.9 ± 0.2	7.0 ± 0.1
Carbohydrate[b]	6.5	9.7
Ash	13.5 ± 0.8	14.7 ± 1.6

a Protein calculated as 6.25 x Total nitrogen

b Carbohydrate estimated as difference

c mean values ± SD

d Purchased from National Sea Products, Terminal Rd., Halifax.
Fish meal > 60% protein < 12% moisture
Fish oil stabilized with antioxidants.

e Nutritional Biochemicals Co.

f composition of vitamin mix given by Castell & Budson 1974

II. FEED CONSUMPTION AND COST

Ablated lobsters are generally fed at least twice a day, six days a week. In order to maximize feed intake, it is necessary to feed as often as possible giving small amounts of feed each time.

The total body weight percent of food per ablated lobster is 1%, per day. At an average feed cost of $0.25/lb., feed costs could calculate to approximately $0.075 per ablated lobster, per month. Non ablated lobsters are fed once a day at .5% body weight.

III. WATER CONDITIONS

A) Temperature

Lobsters are found in waters whose temperature may range from 2°C to 25°C (Aiken 1980). They are capable of becoming acclimatized to values as low as 0°C and as high as 32°C; however, such extremes of temperature considerably reduces their chance for survival. According to Hugues et al (1972), optimum conditions for growth occur at a temperature of between 19°C and 23°C.

B) Salinity

Optimum salinity for the culture, varies between 30 and 31 parts per thousand. When high percentages of recycled water are used, salinity should be monitored to avoid increases caused by evaporation.

C) Dissolved Oxygen

Gates et al (1974) recommend a minimum oxygen level of 6.4 milligrams per liter. Removal of biodeposits and uneaten food eliminates oxygen sinks. Maintaining a proper combination of open system water flow, aeration, and recirculation will prevent suffocating the lobsters. Gates et al (1974) report that with proper care, the culture water for lobsters needs to be renewed every two or three weeks.

D) Un-ionized Ammonia

Delistory et al. (1977) and Sastray and Laczak (1975) have determined that optimal values for the survival of juvenile and adult lobsters should be .14 mg/l and 9.4 mg/l of NH3-N respectively. It should be noted that "canner" size ablated lobsters (200g-300g) require approximately 8 mg/l of NH_3-N.

E) pH.

The pH value expresses the relationship between concentrations of ammonia in ionized form (NH4+) and in un-ionized form (NH_3). Variations in pH may be an indicator of environmental quality, where pH values less than five or greater than nine make it impossible for lobsters to survive (Harriman 1953). The optimal pH value for lobster survival in 8.2.

F) <u>Current</u>

Water flow maintains oxygen levels and removes waste. The volume of water, the temperature, the cleanliness of the system, and the efficiency and rate of water treatment and recirculation determine the water replacement rate.

Huguenin (1976) suggests the use of .83 liter per minute per kilogram (.1 gal/min/16) of biomass. Huges et al. (1972) uses a close system with aeration, filtration, and recirculation with replacement of water every two weeks.

G) <u>Space Requirements</u>

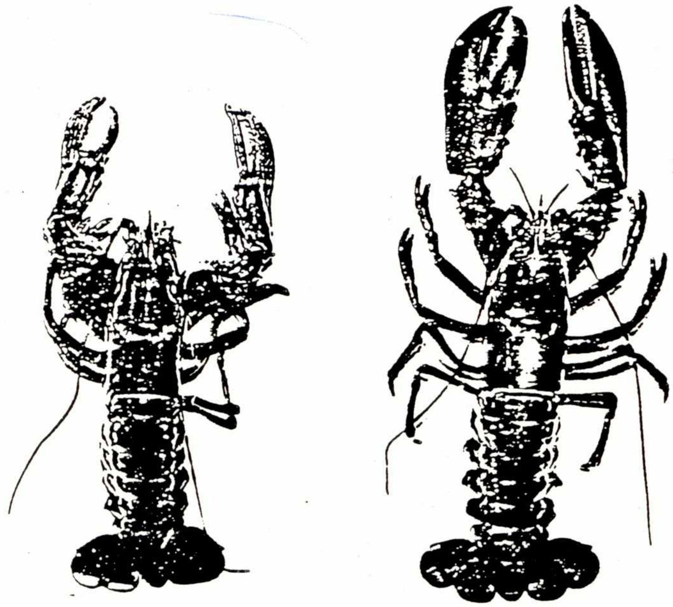
The approximate dimensions of a pan that would not restrict a one pound lobster during its molt was calculated at a pan whose length is twelve inches, width is eleven inches and depth is five inches.

Gates et al. (1974) proposed a minimum volume of 16.8 liters of water per kilogram (2.1 gal/lb) of lobster.

IV. LOBSTER GROWTH

Lobsters grow by shedding their shell, absorbing water to increase their volume, and then replacing the water with tissue over succeeding weeks (Needham 1964). Sustained growth thus is a function of frequency of molt and size increase per molt; and frequently is to some extent dependent upon rate of tissue replacement (Adelung, 1971) and hence nutrition (see Figure 1.).

FIGURE 1. Newly Molted Lobster On left, 15 minutes after moult - claws not filled out. On right, 5 hours later-claws filled out and lobster has reached full size but shell still very soft and meat watery



Genetics and nutrition therefore establish the limits of growth in otherwise favorable conditions, and as such may be considered primary regulators.

In Table 2, the weight gain of "canner" size lobsters during a six month culture experiment is recorded.

TABLE 2. Percentage weight gain of "canner" lobster during 6 month culture experiment.

			Ablated		Control	
Temp.	Sex	Tank	Diet 1	Diet 2	Diet 1	Diet 2
20	M&F	Individual Container	81.1	66.7	-	52.6
15	M&F	"	78.5	63.5	-	49.6
10	M&F	"	59.8	46.7	-	41.1
Ambient2	M&F	"	-	36.1	-	-

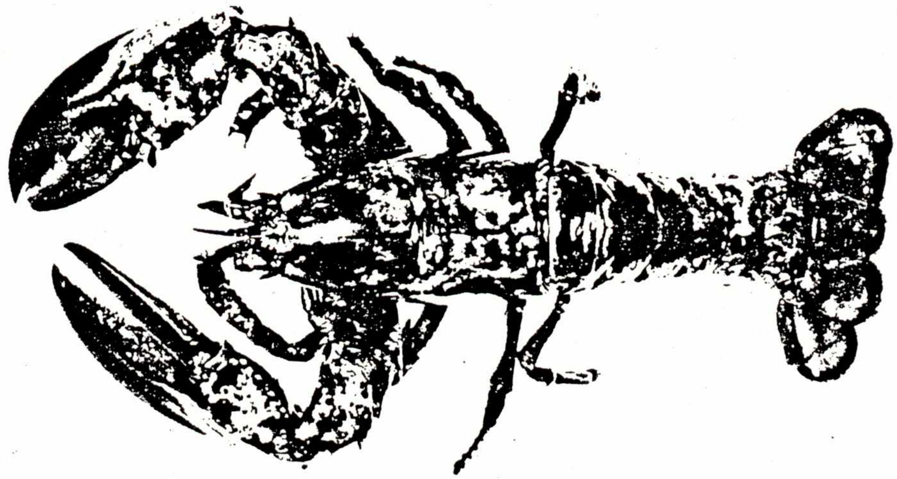
It can be concluded that lobsters are more active in warmer waters and therefore grow at a greater rate when water temperature and good nutrition are continually heuristic. For poundage forecasting, a standard of 79% growth for ablated lobsters at 20°C using feed diet 1 and 16% growth for control lobsters will be used in this paper.

V. MORTALITIES

Mortalities caused by eyestalk ablation is low. Only 6% of operated animals will die within 3 days after the ablation. Like most living things, lobsters are susceptible to several diseases caused by bacteria or fungi. The two bacterial diseases most commonly encountered in communal holding of wild caught lobsters are gaffkemia and shell disease (see Figure 2.). The causative agent of the lethal disease, gaffkemia, is the bacterium _Aerococcus viridans var. homari._ It is found in the lobster's material environment and can be transmitted from the wild to lobster holding operations through infected animals. This bacterium lives in waters between 36°C and 45°C, if such an epidemic were to spread within the holding tanks, lowering of the temperature and minimal feeding till the bacterium is filtered out of the system would alleviate such an epidemic.

Lobsters are cannibals from birth. The small, as well as the large, are ready to prey upon those still smaller or weakened by disease. When crowded in communal tanks, mortality rates may

FIGURE 2. Physical characteristics of lobster with shell disease



be as high as 40%.

With the employment of individual holding compartments, physical interaction among lobsters is eliminated, wounding is prohibited and the spread of gaffkemia is prevented. If some wild gaffkemia lobsters are put into the system, they can be identified as weak animals as the disease progresses and removed from the system to be salvaged for meat without infecting the entire system. Aerococcus viridans var. hornari is not harmful to humans and its infection to a lobster does not reduce the quality of its edible meat.

In total, approximately 20% of the ablated lobsters will die since ablation is a type of wound which may cause shock or graffkemia, resulting in death. The non-ablated lobsters on the other hand have a mortality rate of only 3% (see Table 3.).

LE 3. MORTALITY DATA FOR LOBSTER CULTURE PROJECT.

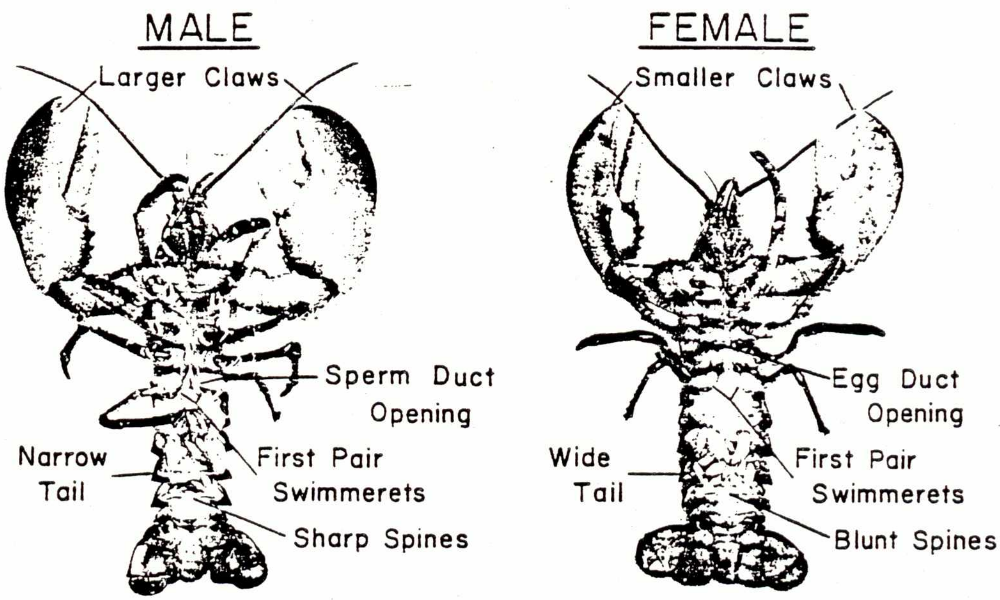
Diet	Treatment	Temp.	Initial No.	Gas Bubble	Cannib-alism	Water Imbalance	Red Kidney	Un-Known	Total Mortality	Retained for Second Molt
1	Ablated	15°C	32	3	4	1	0	3	11/32	2
"	Cont.	"	16	0	1	0	0	0	1/16	0
2	Ablated	"	32	2	2	1	2	5	12/32	2
"	Cont.	"	16	-	-	-	-	-	0/16	-

VI. ABLATION PROCEDURE

Eyestalk ablation greatly accelerates the molting and also increases the weight gain of lobsters which molt.

Lobsters of both sexes are caught at "canner" size in ambient waters (see Figure 3.). The mean (± SD) initial weight of the lobsters is 260 (± 48) grams. The lobsters are then held at ambient temperatures, unfed for at least one week, and not before disease-free status reports have been received. With three snares and five staff members it is possible to ablate approximately 100 lobsters per hour. Ablations can be performed with Brown tonsil snares using gauge 5 or 6 or the ablation can be performed by a ligature made with a loop of 0.3 mm strong polyethylene thread around the base of the eyestalk and pulling the threat tight.

FIGURE 3. Biological differences between a male and female lobster



VII. FACILITY

A) Building Facility

The building provides ample space for two biologists and provides equipment to perform autopsies, weight gain calculations and meat removal at lobster death. Office space is estimated at 150 square feet per biologist. The building includes a 30' x 30' foot space for mechanical systems: water pumps, air compressors, heating systems, an electrical control panel, and storage. The tanks and walkway area is estimated at 2400 square feet. Walkways are 13 feet above ground level allowing for an extra 1000 square feet below walkways for storage and freezing equipment. The head office is also located on site, requiring 1000 square feet.

B) Biological Filter

Although biological filters are the common means of conditioning aquarium water for reuse, there are gaps in design information concerning their applicability in large culture systems. For this reason, a subsystem for recirculation will also be required to efficiently control water conditions. This foam fractionation device will be discussed in the following paragraph.

The biological filter consists of a 1.3 meter (4.3 feet) layer of sharp rock .05 to .63 inches in diameter covered by a 11.8 inch layer of crushed oyster shell .24 to .75 inches in diameter.

Both rack and shell provide surfaces for culture development of nitrifying bacteria. In addition, the shell supplies calcium carbonate, the base for producing calcium nitrate. The shell physically filters particulates which are then removed by back flushing and air agitation without disturbing the bulk of the bacterial community in the rock layer. Biweekly chemical treatment during backflushing eliminates bacteria and algae forming on the shell surface (Burrows and Combs, 1968).

The foam fractionation device alone could be used before the biological filter to remove most of the organics and oxygenate the water. This device removes dissolved and suspended organic material from the water and prevents ammonia buildup. Divivedy (1975) suggests that chlorination after foam fractionation could remove ammonia in 15 to 20 minutes. Activated carbon removes any excess chlorine in the water. Unfortunately the process also removes oxygen molecules so aeration may be necessary.

C) Heating System

Maintain optimum culture temperature for large-scale operations can represent an enormous expense. It requires careful consideration of heating systems and culture water use, but is essential to successful lobster production.

A plastic-film heat-exchange element promises a low cost option for heating culture water. These elements can heat an entire culture water flow of 4500 liters per minute (1,200 gal/min) to at least 9°C above ambient water temperature. With room temperatures at 12°C, this system would work efficiently.

A solar heating system would reduce electrical cost immensely during the July to November months. The system would also decrease electrical expenses during the January to April months, only at a lower scale. The induction of the solar heating system is a must for this project to be successful.

D) Recycling the Water

The use of 10-3hp and 4-1.5hp sea water pumps capable of recycling water at .1 gal/min/lb is sufficient enough to circulate all the culture water. A back up system can be implemented at an economically feasible cost.

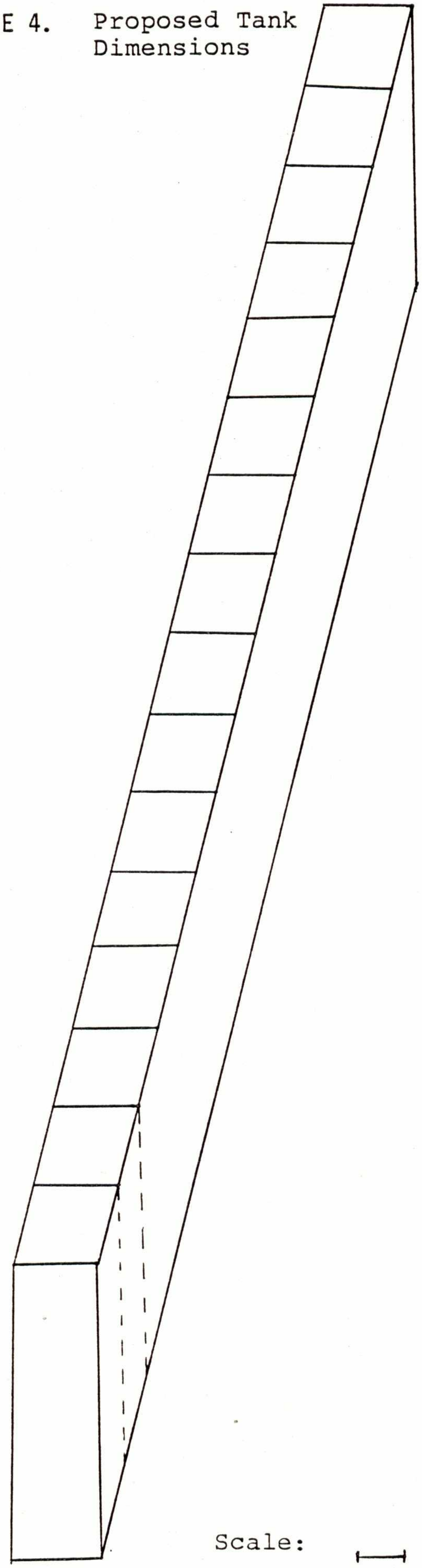
E) Tanks and Trays

The culture system will require 4 large tanks capable of maintaining 7200 lobsters. The tanks are sectioned off by 16 separate columns. Each column will contain 30 trays with a capacity of 16 lobsters per tray. Only 15 columns will be utilized per tank so that feeding operations can easily and quickly be completed by refilling each consecutive empty column allowing minimal out of water stress on the lobsters. For specific dimensions, see Figures 3 and 4.

The tanks are made of aluminum, reducing the chance of rust which may cause disease. The cost to supply and install each tank may range from $15,000 to $25,000 depending on the location of the plant as well as engineering costs for proper resistance structure.

Each tank will require two workers to feed lobster, remove, clean and replace each tray into the empty tank columns. The standard time required to do these functions is 48 seconds per tray. The tray dimensions are shown in Figure 4.

FIGURE 4. Proposed Tank Dimensions



Material; - Aluminum

Length 66.5 ft

Width 4.5 ft

Depth 15 ft

Volume 4488.75 cubic ft

Liquid Volume 127,031.63 litres

33,517.58 gallons

Tank will contain 7200 lobster

1 lobster - .021701 cubic ft

7200 lobsters - 156.25 cubic ft

- 4421.875 litres

- 1166.72 gallons

1 tray - .41666 cubic ft

450 trays - 187.497 cubic ft

- 5306.165 litres

- 1400.043 gallons

The tank requires

33517,579	gallons
-1166.720	
-1400.043	gallons
30950.816	gallons

FIGURE 5. Proposed Tray Dimensions

Tray Size

Length 48"
Width 44"
Depth 5"

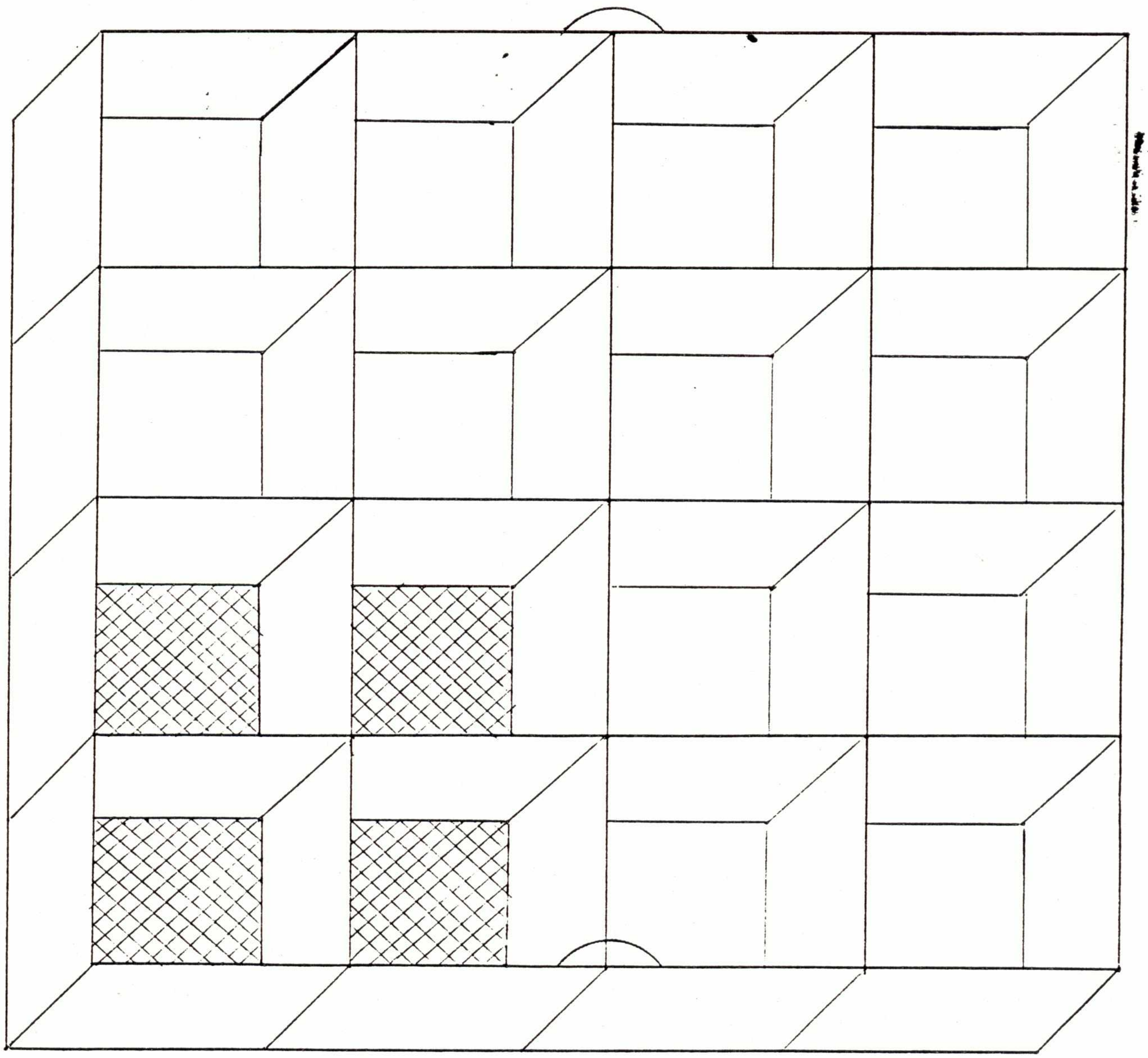
Compartment size

Length 12"
Width 11"
Depth 5"

Material; Aluminum and wire mesh with reinforcement

Boyant Floats

Handles



VIII. LOBSTER MAINTENANCE

Lobsters within each tray are fed, compartments are cleaned of residue and uneaten portions of their feed withdrawn from the compartment. Trays may be sprayed clean with pressure hoses and compartments are checked for damages.

The cultured water is checked every day for disease, temperature, pH, salinity and ammonia concentration.

Biologists will perform autopsies on all mortalities and distract all edible meats from these lobsters. As stated previously, diseased lobster meat is not harmful for human consumption.

IX. REQUIRED MANPOWER

Each tank requires two workers, six hours per day for single daily feeding. The facility requires one or two biologist(s) and a maintenance man to perform preventative maintenance duties. Required manpower is calculated in this manner, two workers need 48 seconds to feed and clean one tray, each tank has 450 trays. Therefore it takes two workers six hours to feed 7200 lobsters and eight workers six hours to feed 28800 lobsters. Activities and time requirements are shown in Table 4.

For analysis purposes, the secretary will be paid on a \$20,000 annual salary and the manager paid on a \$48,000 annual salary.

TABLE 4. COST SCHEDULE.

Preparation of Food

Operation	Time	Personnel	Cost
a) Preparation of Food			
- grind lobster bodies	16h	1	$104.00
- grind crab bodies	16h	1	104.00
- steam sea urchins	16h	1	104.00
- ground sea urchins	16h	1	104.00
- thaw and mix	32h	2	416.00
- add ingredients	16h	1	104.00
- complete process	20h	1	130.00
			*$1066.00
*completed once a month			
b) Daily Activities			
- feeding	6h[1]	8	$336.00
- biology work	6h[2]	2	96.00
- cleanup	1/2h	8	28.00
			$460.00
c) Maintenance			
- general work	6h	1	$42.00
			$42.00
d) Office Work			
- secretary		1	salary
- manager		1	salary

[1]feed once per day.

[2]check water once a day.

X. LOBSTER REQUIREMENTS

The "canner" (1/2 - 3/4 lb) lobster can be obtained in early Spring, late Summer and late Fall. The "canner" is sold for the lowest price per unit weight of all the size classes of lobster: canner(1/2 - 3/4 lb), market(3/4 - 1 1/2 lb), and select(1 1/2- 2 1/2 lb).

These "canner" lobsters can be purchased along the coast of P.E.I., Nova Scotia, Halifax and the West Coast of Newfoundland. Both sexes are acceptable, but there is a preference for males since they gain weight at a slightly greater rate.

XI. TRANSPORTATION

Live lobsters are stored in floating wooden crates or larger "cars", in wooden shore based tanks supplied with running sea water or in much larger tidal "pounds". When shipped by boat, truck, train or aircraft to markets across Canada, the United States and several European countries they survive quite well if carefully handled, and kept cool and moist.

A) Short-Distance

Trucks are commonly used when transportation is within a few hundred miles. Standard, 100 lb crates are usually used for such shipments. For the short trips in cool weather, crates are simply stacked in open trucks and protected from wind and rain by a tarpaulin. On longer trips and in warmer weather conditions, crushed ice is packed on and between the crates which are then covered with a tarpaulin (see Figure 6.). Shipping during the heat of the day and during extremely warm weather should be avoided whenever possible. During extremely cold weather a closed truck provided with a heater would protect lobsters from freezing.

FIGURE 6. Icing crates for shipment by truck in warm weather

B) Long-Distance

Bulk shipments of up to 20,000 lbs by truck or 100,000 lbs by boat are usually packed in standard 100 lb capacity crates and stored as previously mentioned to maintain a 35-40°F temperature for one or two days.

Long distances across Canada are sometimes made by railway express. Specially designed, cube shaped, double-compartments, wooden shipping boxes are commonly used. About 5 lbs of wet rockweed is placed in the bottom of the compartment, 50 lbs of lobster is carefully added, another layer of rockweed is placed on top of them and the inner compartment is closed with a tight-fitting wooden cover.

With respect to air shipment, containers must provide sufficient space for up to 10 lbs of ice when required during warm temperatures. If the container is tightly sealed, lobsters will die from asphyxiation within 24 hours. On the other hand, with too open construction there is excessive air exchange, rapid drying of gill surface, and greater temperature change. A reasonable compromise can be reached by using a tightly constructed container and provide two air vents about one half inch in diameter on opposite sides of the box.

XII. MARKETING ANALYSIS

Almost 90 percent of Canadian lobster catch is exported and the balance is consumed in Canada. About 67 percent of the lobster exports go to the United States and the balance of 23 percent goes to Europe.

A) U.S. Market

For over 40 years the United States have purchased the largest share of the Canadian lobster catch. As most of the U.S. catch is concentrated from July to November, Canadian lobsters are in greatest demand in the U.S. during the off season. From April to July and again in November and December Canadian lobsters come directly from the catch as well as from lobster pounds in Canada and the U.S.

Imports of Canadian live lobsters in the U.S. for 1985 by month are shown in Table 5.

As can be seen from the table, imports in May and June account for nearly half of the total. The other important months are December, January, and July. December is from current

TABLE 5: MONTHLY UNITED STATES IMPORTS FROM CANADA, 1985 (IN METRIC TONS).

Total	Jan.	Feb.	Mar.	April.	May	June	July	Aug.
6,940	693	351	297	401	1706	1811	608	317
	Sept.	Oct.	Nov.	Dec.				
	170	91	63	791				

Source: Market Bulletin, Shellfish, Fisheries and Oceans, October 1985.

production while January and July are from the previous month's production and are from lobster pounds.

It has always been accepted by most economists that in the long term the demand for lobster in the U.S. is inelastic as to price. This is not so in the short term, the highest prices on both the Boston and New York markets are in March and early April although they are high from December through to April. In the Winter, the market could absorb considerably more lobster, say an additional 2000 tonnes, without depressing prices. (F.J. Daucit Consultant Ltd., 1983). As the dealers have pointed out, the lower prices in Spring and Summer attract a different group of consumers. In the Winter the consumers of lobsters are mostly regular restaurant clients pruchasing up to 5000 lbs of lobster per week while in the Summer this group is enlarged by the addition of tourists.

B) European Market

The largest importers of Canadian lobsters in Europe is France with Belgium and the Netherlands next. France and Belgium combined take over 75 percent of Canadian lobsters export to Europe.

With the introduction of the brine frozen lobsters, the European market has become very important. In 1981 it absorbed 28 percent of the Canadian lobster exports. The export basket comprised 1134 tones of live lobsters, 3076 tonnes of brine frozen lobster and 2500 tonnes of canned product (frozen and hot pack). Exports of live lobsters stayed around 1200 tonnes in the last three years and are predicted to increase during the next couple of years. The brine frozen lobsters entered the European market in 1976 and took off reaching over 3000 tones in 1981. Details of lobster sales in Europe are shown in Table 6.

B.1) United Kingdom Market

Of the European countries that import Canadian lobsters, the United Kingdom is the only one with a significant domestic production. Most of the lobsters are caught in the Summer and at that time it is difficult to sell Canadian lobsters. The United Kingdom market will take Canadian lobsters from November to April or early May but not during the Summer. Prices paid to fisherman is about double the price paid to Canadian fisherman making lobsters very expensive to the consumer.

TABLE 6. EXPORTS OF LOBSTER PRODUCTS TO EUROPE 1981.

Country of destination	products (in metric tons)			
	Live	Frozen in shell	Frozen meat	Other
United Kingdom	101	223	20	-
Belgium Luxemburg	237	978	-	-
France	279	1250	305	-
West Germany	122	75	-	-
Netherlands	268	125	-	-
Switzerland	51	-	-	-
Denmark	-	64	-	-
Sweden	-	261	42	-
Other	76	88	91	118
Total	1134	3066	458	118

Source: Canadian Fisheries Annual Statistical Review

The United Kingdom lobsters, usually referred to as Scottish lobsters, command a premium price. Consumers pay about $2.00 per pound more for Scottish than for Canadian lobsters. Nevertheless, Canadian lobsters are well received and the Billingsgate traders expect their sales to increase. The market price can absorb the EEC duty without difficulty and there is no luxury tax on lobsters in the United Kingdom.

B.2) French Market

The French consume large quantities of seafood in the home as well as in restaurants. Shellfish is very popular at all times but as consumption is also associated with holidays, sales of all shellfish species are highest at Christmas, New Years and

Easter. As all good restaurants feature a variety of seafoods, the large numbers of tourists in France throughout the year add to the consumption of fish.

France's production of lobster is very small, less than 400 tonnes and even with the importation of an additional 400 tones from the United Kingdom, there is not enough to satisfy demand. Moreover, European lobsters are very expensive and only the wealthy can afford to buy them. The introduction of Canadian live lobsters at a lower price has attracted new consumers.

French importers of Canadian lobsters are very satisfied with the sizes and quality of the live lobsters as well as the delivery service. Imports of Canadian live lobsters are about 300 tonnes and most of them come from catches in November. This is a good opening date for the French Christmas market.

XIII. FINANCIAL ANALYSIS

General scenarios have been prepared which illustrate the effect of various markets and variations of seasonal expenses. The table below illustrates the basic information used in each scenario.

TABLE 7. BASIC CHARACTERISTICS OF EACH SCENARIO.

- the production unit is 28,800 lobsters
- lobsters are purchased at 3/4 lb "canner" size
- feed costs are estimated at $0.25/lb
- workers are paid at a rate of $7.00 per hr.
- biologists are paid at a rate of $8.00 per hr.
- secretary salary is $20,000 annually
- manager's salary is $40,000 annually
- the firm will purchase 30,000 lobster per season. The extra 1200 will be meated at 25% of their body weight
- lobsters should be selected within a few days after they have been caught
- the lobsters selected are free of injury and have both claws
- the objective of the culturation operation is to keep and fatten the lobster
- water conditions are monitored every day

The following models represent different alternatives available to the firm and their respective costs. Each alternative will require slight operational alterations, resulting in either more profitable or unfeasible economic standing.

Model 1

- all lobsters are fed twice daily
- all lobsters are ablated (see ablation process)
- all tanks are kept at 20°C
- analysis on both the U.S. market and the European market

- U.S. market price per pound, \$5.74 canadian
- European market price per pound, \$7.80 canadian
- purchase price from P.E.I. for 3/4 lb lobster, \$2.60 delivered
- air-freight to U.S. market, \$0.32/lb
- air-freight to European market, \$0.75/lb

Model 2

- same as model 1 except,
  a) no lobsters are ablated
  b) feed lobsters once per day

Model 3

- split the culture plant in half with ablated and non-ablated
- feed ablated twice per day and feed non-ablated once per day
- the remaining information stays the same as in model 1.

The following exhibits represent pro forma cash flows. Cash flow statements simply describe the cash generated by an operation and the cash requirements of that operation. These statements, although somewhat similar to income statements, are not to be confused with them. For example, depreciation, which would appear on an income statement, is not included in a cash flow analysis because it is not a real expense. Similarly , only interest on long term debts would appear as an expense on an income statement, however, because the principle must be repaid, both principle and interest are accounted for in a cash flow analysis. A cash flow analysis is especially useful when attempting to predict the economic viability of new, relatively small businesses.

Exhibit 1a (Model 1)

Pro Forma Cash Flow (season 1)

	U.S. Market	European Market
Source of funds:		
Sale of lobster	$178,537 @ $5.74/lb	$242,611 @ $7.80/lb
Sale of recovered meat	$36,630 @ $22.00/lb	$36,630 @ $22.00/lb
Total	$215,167	$279,241
Uses of funds:		
Raw material	$ 58,500	$ 58,500
Feed	9,360	9,360
Labour	141,823	141,823
Transportation	9,953	23,328
Variable costs	24,500	24,500
Loan payment	10,000	10,000
Total	$254,136	$267,511
Net Cash Flow	<$ 38,969>	$ 11,730

Exhibit 1b (Model 1)

Pro Forma Cash Flow (season 2)

	U.S. Market	European Market
Source of funds:		
Sale of lobster	$200,309 @ $6.44/lb	$251,942 @ $8.10/lb
Sale of recovered meat	$36,630 @ $22.00/lb	$36,630 @ $22.00/lb
Total	$236,939	$288,572
Uses of funds:		
Raw material	$ 63,000	$ 63,000
Feed	7,488	7,488
Labour	119,125	119,125
Transportation	9,953	23,328
Variable costs	19,600	19,600
Loan payment	10,000	10,000
Total	$229,166	$242,541
Net Cash Flow	$ 7,773	$ 46,031
Summary:		
season 1	<$ 38,969>	$ 11,730
season 2	$ 7,773	$ 46,031
Total Cash Flow	<$ 31,196>	$ 57,761

Exhibit 2a (Model 2)

Pro Forma Cash Flow (season 1)

	U.S. Market		European Market	
Source of funds:				
Sale of lobster	$139,504	@ $5.74/lb	$189,571	@ $7.80/lb
Sale of recovered meat	$8,734	@ $22.00/lb	$8,734	@ $22.00/lb
Total	$148,238		$198,305	
Uses of funds:				
Raw material	$ 58,500		$ 58,500	
Feed	4,680		4,680	
Labour	94,503		94,503	
Transportation	7,777		18,228	
Variable costs	24,500		24,500	
Loan payment	10,000		10,000	
Total	$199,960		$210,411	
Net Cash Flow	<$ 51,722>		<$ 12,106>	

Exhibit 2b (Model 2)

Pro Forma Cash Flow (season 2)

	U.S. Market		European Market	
Source of funds:				
Sale of lobster	$156,517	@ $6.44/lb	$196,676	@ $8.10/lb
Sale of recovered meat	$8,734	@ $22.00/lb	$8,734	@ $22.00/lb
Total	$165,251		$205,596	
Uses of funds:				
Raw material	$ 63,000		$ 63,000	
Feed	3,744		3,744	
labour	81,272		81,272	
Transportation	7,777		18,228	
Variable costs	19,600		19,600	
Loan payment	10,000		10,000	
Total	$185,393		$195,844	
Net Cash Flow	<$ 20,142>		$ 9,752	
Summary:				
season 1	<$ 51,722>		<$ 12,106>	
season 2	<$ 20,142		$ 9,752	
Total Cash Flow	<$ 71,864>		<$ 2,354>	

Exhibit 3a (Model 3)

Pro Forma Cash Flow (season 1)

	U.S. Market	European Market
Source of funds:		
Sale of lobster	Ab. $89,268	$121,305
	Can. $69,752	$94,795
	$158,954 @ $5.74	$216,091 @ $7.80/lb
Sale of recovered meat	Ab. $18,315	$18,315
	Can. $4,367	$4,367
	$22,682 @ $22.00	$22,682 @ $22.00/lb
Total	$181,702	$238,773
Uses of funds:		
Raw material	$ 58,500	$ 58,500
Feed	7,020	7,020
Labour	118,163	118,163
Transportation	8,865	20,778
Variable costs	24,500	24,500
Loan payment	10,000	10,000
Total	$227,048	$238,961
Net Cash Flow	<$ 45,346>	<$ 188>

Exhibit 3b (Model 3)

Pro Forma Cash Flow (season 2)

		U.S. Market	European Market
Source of funds:			
Sale of lobster	Ab.	$100,154	$125,971
	Con.	$78,258	$98,431
		$178,413 @ $6.44/lb	$224,402 @ $8.10/lb
Sale of recovered meat	Ab.	$18,315	$18,315
	Con.	$4,367	$4,367
		$22,682 @ $22.00/lb	$23,234 @ $22.00/lb
Total		$201,095	$247,084
Uses of funds:			
Raw material		$ 63,000	$ 63,000
Feed		5,616	5,616
Labour		100,198	100,198
Transportation		8,865	20,778
Variable costs		19,600	19,600
Loan payment		10,000	10,000
Total		$208,911	$220,819
Net Cash Flow		<$ 6,184>	$ 27,892
Summary:			
season 1		<$ 45,346>	$ 188
season 2		<$ 6,184>	$ 27,892
Total Cash Flow		<$ 51,530>	$ 27,704

XIV. CONCLUSION

The Pro Forma cash flows previously studied indicated a positive future in lobster aquaculture for the exportation of live lobster in Europe. Exact cash flows can not be calculated since there are many uncontrollable factors. Such factors as supply and demand, natural disasters that may decrease your forecasted stock, problems in purchasing "canner" lobsters, poor conditions for transportation purposes, and the availability of funds from both the Provincial Government and private investors. These factors make the project risky but not unfesible. The idea of reducing risk for the first year by reaising 50% ablated lobsters and 50% non-ablated is assuring to prospective investors. With a 70% learning curve, the project can increase the number of ablated lobsters and decrease the number of non-ablated lobsters generating larger profits in the future and maintaining the risk variable as low as possible.

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APPENDIX I
SUPPLIMENTARY DIET FORMULAE

SUPPLEMENTARY DIET 1

TABLE 1. Percent composition of the natural and casein based diets.

Natural Diet			
Shrimp waste (heads, shells)[1]	50	Casein	40
Crab meal	15	Gelatin	10
Fish meal	20	α-Cellulose	27.8
Wheat Middlings	10	Corn starch[3]	5
Gelatin	5	Mineral mix	3
		Glucosamine	1
		Cholesterol	0.5
		Vitamins	3.2
		Cod liver oil	9.5

[1]Shrimp *Pandalus borealis*

[2]Ingredients from ICN

[3]Modified Bernhart-Tomarelli

Table 2 Survival and average weights of lobsters fed the natural and casein diets after 4 weeks. (m=mesh bottom tray; s=solid bottom tray)

Diet	Survival (/60)	Weight(mg) (ave+SD)
Casein (m)	15	124±30
Casein (s)	27	136±36
Natural (m)	54	220±52
Natural (s)	58	256±50

SUPPLEMENTARY DIET 2

Table 1 Basal diet for pound feeding

Fish Meal	30%
Yeast	10%
Alfalfa	10%
Flour	47%
Kelp Meal	3%

Table 2 Calculated analysis of lobster pound diet

Crude Protein	33.40%
Fat	4.90%
Ash	4.90%
Fiber	4.60%
Ca	1.09
P	.8

Ca/P = 1.33

g. protein/Kcal program = .082

Table 3 Mean air weights of lobsters (grams)

	N	Initial	Final	Gain
Cholesterol	20	508	513	04*
No Cholesterol	20	519	529	10*

Mean water weights of lobsters (grams)

	Initial	Final	Gain
Cholesterol	**39**	**43**	**4**
No cholesterol	**36**	**44**	**8**

***Anova significance at less than 0.05**

Table 1 Composition of test feeds (% dry weight basis).

Ingredient	Feeds A	B	C	D
Herring meal[1]	7.77	7.77	7.77	-
Shrimp meal[2]	30.58	26.21	21.84	-
Sweet whey[3]	4.85	4.85	4.85	-
Soybean meal[4]	2.91	2.91	2.91	-
Rice bran[5]	19.42	19.42	19.42	-
Corn starch[4]	8.74	13.11	17.48	-
Brewer's yeast[6]	11.65	11.65	11.65	-
Vitamin mix[4,7]	1.94	1.94	1.94	-
Lecithin[4]	0.97	0.97	0.97	-
Cod liver oil[4]	4.85	4.85	4.85	-
Bernhart-Tomarelli salt mix[4]	2.91	2.91	2.91	-
Kelgin[8]	1.94	1.94	1.94	-
Sodium metaphosphate[9]	1.46	1.46	1.46	-
Frozen brine shrimp[10]	-	-	-	100.00

[1]James Farrell & Co., Seattle

[2]Southland Canning & Packing Co., New Orleans

[3]Kraft Foods, Chicago

[4]ICN Pharmaceutical, Inc., Cleveland

[5]Uncle Ben's, Inc., Houston

[6]Millibrew, Inc., Juneau, Wisconsin

[7]Castell and Budson (1974)

[8]Kelco Co., San Diego

[9]Fisher Scientific

[10]Metaframe Co., Newark, California

Table 3 Growth and food conversion of postlarval lobsters fed the test feeds for 120 days.

Measurement	Group A	B	C	D
Initial weight (grams)	0.189 (0.005)	0.193 (0.007)	0.192 (0.009)	0.195 (0.010)
Final weight[1] (grams)	2.572 (0.075)	2.002 (0.110)	1.977 (0.025)	2.487 (0.113)
Weight increase/day (grams/day)	0.020	0.015	0.015	0.019
No. Molts	6	6	6	6
% Mortality	3.0	8.0	10.0	18.0
Food given[2] (grams)	4.530	3.925	3.950	4.785
FCR[3]	1.90	2.20	2.20	2.10

[1] Wet weight, mean of 20 animals (± 1 standard error).

[2] Sum of average feeding rates of each postlarval stage.

[3] Food conversion ration = $\frac{\text{total dry wt. of food fed (grams).}}{\text{total wet wt. gain (grams)}}$

Table 1 Diet composition.

Component	Diet Number 79-1 %*	79-2-N %*	79-2-E %*	79-3 %*	79-4 %*
Enriched Wheat Flour	45	47	47	46	48
Soybean Meal	11	11	11	7	7
Feather Meal	8	9	9	9	9
Poultry Meal	5	6	6	5	6
Menhaden Meal	5	6	6	5	6
Alfalfa Meal	5	6	6	5	6
Shrimp Meal	5	-	-	-	-
Protein Supplement	-	-	-	5	6
Torula Yeast	1	1	1	-	-
Brewers Yeast	1	1	1	2	2
Lecithin	1	1	1	1	1
Cholesterol	.5	.5	.5	.5	.5
Oleoresin of Paprika	.5	-	-	-	-
Whey	1	1	1	1	1
Mineral Premix	2	2	2	2	2
Vitamin Premix**	2	2	2	1	1
Palm Oil	-	.5	.5	-	-
Fish Oil	3	-	-	1	3
Vegetable Oil	2	-	-	-	2
Hard Fat	-	-	-	2	-
Margerine	-	7	7	-	-
Emulsifier***	-	-	-	2	-
Water	-	-	-	2	-

*To the nearest percent.

**ICN Vanderzant with dextrose replacing ascorbic acid.

***Dimidan TH monoglyceride Grinstead Products.

Table 2 Growth Analysis.

	Average initial size	Average final size	Percent increase	Average daily increase mm	% of control mm daily increase	% of control % daily increase	Mortality	% Mortality
*79-1	6.77	11.40	68	.051	75	90	18	41
S.D.	0.51	1.30						
**79-2-N	6.93	11.71	69	.053	78	92	35	80
S.D.	0.61	1.13						
*79-2-E	7.00	11.15	59	.046	68	88	23	52
S.D.	0.48	1.13						
**79-3	6.90	9.85	59	.033	45	73	13[1]	30
S.D.	0.54	1.01						
**79-4	7.10	11.00	65	.044	59	82	7	16
S.D.	.67	1.18						
BS-1	6.80	13.40	98	.074	--	--	11[2]	25
S.D.	.62	1.14						
BS-2	6.60	12.71	92	.068	--	--	9	20
S.D.	.69	1.27						

*Diet compared to B5-2 because they were in the same water supply.
**Diet compared to B5-1 because they were in the same water supply.

[1]Five Animals were missing one day when the water level went over the top of the cage.

[2]Six of the deaths were on the same day during a low water fluctuation.

S.D. = Standard Deviation.

Table 1 Percent composition of diets 1-8 (dry weight basis) as tested in experiment 2.

Ingredients[a]	1 Brine Shrimp	2 Conklin's* Casein (31.0) Albumin (4.0)	3 Casein (50.0)	4 Casein-[d] (50.0)	5 Sea Urchin[e] (50.0)	6 Mussel (50.0)	7 Crab (50.0)	8 Shrimp (50.0)
Gelatin			10.0	10.0	10.0	10.0	10.0	10.0
Gluten		15.0						
α-Cellulose		4.0	18.8	11.3	11.3	11.3	11.3	11.3
Cornstarch		26.7	5.0	5.0	5.0	5.0	5.0	5.0
Mineral Mix[b]		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Cholesterol		0.5	1.0	1.0	1.0	1.0	1.0	1.0
Vitamin Mix		2.0	2.0	2.0	2.0	2.0	2.0	2.0
Cod Liver Oil			9.0	9.0	9.0	9.0	9.0	9.0
Lipid Mix S		6.0						
A/D_3		0.1						
Vitamin E[c]		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Lecithin		7.5		7.5	7.5	7.5	7.5	7.5
Choline chloride (70%)			1.0	1.0	1.0	1.0	1.0	1.0

[a]All ingredients were obtained from ICN Nutritional Biochemicals, Cleveland, Ohio except Vitamins E, A and D, which were purchased from Roche Chemical Division, Nutley, N.J. and cholesterol which was obtained from Sigma Chemicals, St. Louis, Missouri.

[b]Bernhart - Tormarelli salt mix

[c]Concentration of Vitamin E in diet 2 is diluted by 50%.

[d]The sea urchins were collected from the Bay of Fundy while the mussel and crab were removed from the Northumberland Strait. Frozen Penaeus shrimp tails were received from Demerico Corp., Brownsville, Texas.

*Conklin's Casein-Albumin diet without lecithin was readjusted to contain 11.5 cellulose instead of the 4% used for experiment 2.

SUPPLEMENTARY DIET 5

Table 2 Growth and survival data for diets 1-8 for experiment 2.

Diet	Protein	Initial Wet Weight (mg) mean - S.D.	Final Wet Weight (mg) mean - S.D.	% Weight Gain	% Survival
1	-(brine shrimp)	62 ± 21	175 ± 58	182	87.1[A]
2	Conklin's Casein-Albumin	61 ± 19	263 ± 82	323	30.6[B]
3	Casein	70 ± 25	143 ± 94	104	13.1[BC]
4	Casein-	70 ± 25	314 ± 29	350	7.5[C]
5	Sea Urchin	70 ± 25	200 ± 59	187	87.5[A]
6	Mussel	53 ± 16	214 ± 94	300	65.8[A]
7	Crab	63 ± 22	343 ± 118	446	95.0[A]
8	Shrimp	81 ± 27	297 ± 10	266	5.2[C]

[a]Significant differences at .01% level is indicated by different superscripts.

Table 3 Analysis of variance for differences in mean weight gain of lobsters fed diets 1-8. The diet groups are arranged in increasing rank order.

Diet	Diet 3 Casein (90.00)	1 Br. Shrimp (112.06	5 Urchin (126.54)	6 Mussel (157.35)	8 Shrimp (172.00)	2 Casein-Alb. (202.64)	4 Casein* (230.67)	7 Crab (255.37)
3 Casein (90.00)[a]	--							
1 Br. Shrimp (112.06)	22.06[b]	--						
5 Urchin (126.54)	36.54	14.48	--					
6 Mussel (157.35)	67.35	45.29*	30.81	--				
8 Shrimp (172.00)	82.00	59.94	45.46	14.65	--			
2 Casein-Alb.(202.64)	112.64*	90.58*	76.10*	45.29	34.64	--		
4 Casein+ (230.67)	140.64*	118.61*	104.13*	73.32	58.67	28.02	--	
7 Crab (255.37)	165.37*	143.31*	128.83*	98.02*	83.37	52.73*	24.70	--

[a]Numbers in parenthesis represent the mean weight gain after 11 weeks.
[b]Numbers in the table represent differences in mean weight between diet groups.
*Significant difference ($P<0.05$) in mean weight gain between diet groups.

Table 4 Percent ash, moisture and purity of dietary proteins.

Component	Protein Casein	Albumin	Shrimp	Crab	Urchin	Mussel
ash[a]	0.9±.7	2.5±0.3	4.9±0.1	15.9±0.5	26.1±0.5	6.8±0.3
moisture[b]	9.9+.1	7.4+0.3	7.9+0.5	3.5+0.1	9.3+0.2	10.3+0.8
protein[c]	91.5	93.2	68.9	32.8	28.2	44.3

[a]% dry weight basis

[b]water content after lyophilization

[c]% purity based on total protein sample (g/100 sample)

APPENDIX II
PRO FORMA CASH FLOW DETAILS

Exhibit 1a

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	30,000 lobster (purchase quality) -1,200 lobster (extra) 28,800 lobster -5,760 lobster (20% mortality) 23,040 lobster x 1.35 lbs (conversion to weight) 31,104 lbs
lobster meat recovered for sale	1,200 lobster (extra) x .75 lbs (conversion to weight) 900 lbs x .25 (recovery ratio) 225 lbs
	5,760 lbs x 1.0 lbs (conversion to weight) 5,760 lbs x .25 (recovery ratio) 1,400 lbs

Uses of funds:

Raw material	30,000 lbs x $1.95/lb
Feed	28,800 lobster x 1% body weight x 130 days x $0.25/lb
Labour	16 workers x $7/hr x 6 1/2 hrs x 130 days 1 worker x $7/hr x 7 hrs x 130 days 2 biologists x $8/hr x 6 hrs x 130 days secretary ($20,000 x .416 yrs) manager ($48,000 x .416 years)
Transportation	31,104 lbs x air freight cost
Variable Cost	5 months x 1,700 (electricity) 5 months x 2,200 (electricity) 5 months x 1,000 (preventative maintenance)
Loan	$150,000 for 25 years @ 11%

Exhibit 1b

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	30,000 lobster (purchase quality)
	-1,200 lobster (extra)
	28,800 lobster
	-5,760 lobster (20% mortality)
	23,040 lobster
	x 1.35 lbs (conversion to weight)
	31,104 lbs
lobster meat recovered for sale	1,200 lobster (extra)
	x .75 lbs (conversion to weight)
	900 lbs
	x .25 (recovery ratio)
	225 lbs
	5,760 lbs
	x 1.0 lbs (conversion to weight)
	5,760 lbs
	x .25 (recovery ratio)
	1,400 lbs

Uses of funds:

Raw material	30,000 lbs x $2.1/lb
Feed	28,800 lobster x 1% body weight x 104 days x $0.25/lb
Labour	16 workers x $7/hr x 6 1/2 hrs x 104 days 1 worker x $7/hr x 7 hrs x 104 days 2 biologists x $8/hr x 6 hrs x 104 days secretary ($20,000 x .416 yrs) manager ($48,000 x .416 years)
Transportation	31,104 lbs x air freight cost
Variable Cost	4 months x 1,700 (electricity) 4 months x 2,200 (electricity) 4 months x 1,000 (preventative maintenance)
Loan	$150,000 for 25 years @ 11%

Exhibit 2a

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	30,000 lobster (purchase quality) -1,200 lobster (extra) 28,800 lobster - 864 lobster (3% mortality) 27,936 lobster x .87 lbs (conversion to weight) 24,304 lbs
lobster meat recovered for sale	1,200 lobster (extra) x .75 lbs (conversion to weight) 900 lbs x .25 (recovery ratio) 225 lbs
	864 lbs x .80 lbs (conversion to weight) 691 lbs x .25 (recovery ratio) 172 lbs

Uses of funds:

Raw material	30,000 lbs x $1.95/lb
Feed	28,800 lobster x .5% body weight x 130 days x $0.25/lb
Labour	8 workers x $7/hr x 6 1/2 hrs x 130 1 worker x $7/hr x 7 hrs x 130 2 biologists x $8/hr x 6 hrs x 130 secretary ($20,000 x .416 yrs) manager ($48,000 x .416 years)
Transportation	24,304 lbs x air freight cost
Variable Cost	5 months x 1,700 (electricity) 5 months x 2,200 (electricity) 5 months x 1,000 (preventative maintenance)
Loan	$150,000 for 25 years @ 11%

Exhibit 2b

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	30,000 lobster (purchase quality) -1,200 lobster (extra) 28,800 lobster - 864 lobster (3% mortality) 27,936 lobster x .87 lbs (conversion to weight) 24,304 lbs
lobster meat recovered for sale	1,200 lobster (extra) x .75 lbs (conversion to weight) 900 lbs x .25 (recovery ratio) 225 lbs
	864 lbs x .80 lbs (conversion to weight) 691 lbs x .25 (recovery ratio) 172 lbs

Uses of funds:

Raw material	30,000 lbs x $2.10/lb
Feed	28,800 lobster x .5% body weight x 104 days x $0.25/lb
Labour	8 workers x $7/hr x 6 1/2 hrs x 104 days 1 worker x $7/hr x 7 hrs x 104 days 2 biologists x $8/hr x 6 hrs x 104 days secretary ($20,000 x .416 yrs) manager ($48,000 x .416 years)
Transportation	24,304 lbs x air freight cost
Variable Cost	4 months x 1,700 (electricity) 4 months x 2,200 (electricity) 4 months x 1,000 (preventative maintenance)
Loan	$150,000 for 25 years @ 11%

Exhibit 3a

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	1/2 x Exhibit 1a poundage 1/2 x Exhibit 2a poundage
lobster meat recovered for sale	1/2 x Exhibit 1a poundage 1/2 x Exhibit 2a poundage

Uses of funds:

Raw material	30,000 lobsters @ $1.95/lb
Feed	1/2 Exhibit 1a 1/2 Exhibit 2a
Labour	1/2 Exhibit 1a 1/2 Exhibit 2a
Transportation	1/2 Exhibit 1a poundage 1/2 Exhibit 2a poundage
Variable Cost	5 months x 1,700 5 months x 2,200 5 months x 1,000
Loan	$150,000 for 25 years @ 11%

Exhibit 3b

Pro Forma Cash Flow

Source of funds:

lobsters available for sale	1/2 x Exhibit 1b poundage 1/2 x Exhibit 2b poundage
lobster meat recovered for sale	1/2 x Exhibit 1b poundage 1/2 x Exhibit 2b poundage

Uses of funds:

Raw material	30,000 lobsters @ $2.10/lb
Feed	1/2 Exhibit 1b 1/2 Exhibit 2b
Labour	1/2 Exhibit 1b 1/2 Exhibit 2b
Transportation	1/2 Exhibit 1b poundage 1/2 Exhibit 2b poundage
Variable Cost	4 months x 1,700 4 months x 2,200 4 months x 1,000
Loan	$150,000 for 25 years @ 11%