A COMPARATIVE STUDY ON THE LENGTH AND WEIGHT OF MILKFISH FINGERLINGS WHEN FED WITH ROTIFER AND COMMERCIAL FEED DIET FOR THREE MONTHS

A Research Paper Presented

To the Faculty of the

Philippine Science High School Western Visayas

Iloilo City

In Partial Fulfillment of the Requirements

In Science Research II

By

Bacalian, Philip Galvin
Jardeleza, Melecio Gil
Mabunay, Michael Andrew

March 2005

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS
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APPROVAL SHEET

A Research Paper Requirement

for Science Research II

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ACKNOWLEDGEMENT

The researchers are deeply thankful to the following people who have helped much for the success of this study:

Mr. Marvin L. Cadornigara, for the patience, guidance and technical advice in teaching us;

Mr. Aris C. Larroder, for his help in the statistical part of this study;

Mrs. Rowena M. Labrador, Mr. Jose Ariel S. Serrato, and Mrs. Lea Salinel, for their help and suggestions in improving this study;

Above all, to God Almighty, for the great wisdom and guidance.

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March 2005

PHILIPPINE SCIENCE HIGH SCHOOL WESTERN VISAYAS
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Bacalian, Philip Galvin; Jardeleza, Melecio Gil; Mabunay, Michael Andrew; "A comparative study on the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months." Unpublished Research II Paper. Philippine Science High School Western Visayas, Iloilo City.

Abstract

This study aims to compare the length and weight of milkfish fingerlings after being fed with rotifer and commercial feed diet for three months. It will specifically determine if there is a significant difference in the length and weight of milkfish fingerlings when fed with a natural and an artificial diet after three months.

Results showed that commercial feed diet grew longer and heavier milkfish fingerlings after three months of feeding. However, the difference in the mean length and mean weight was very small. There existed no significant difference in the length and weight of milkfish fingerlings after being fed with their respective diets for three months.

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A COMPARATIVE STUDY ON THE LENGTH AND WEIGHT OF MILKFISH FINGERLINGS WHEN FED WITH ROTIFER AND COMMERCIAL FEED DIET AFTER THREE MONTHS

Chapter I

Introduction of the Study

Background of the Study

Milkfish (*Chanos chanos*) is the only species in the Family Chanidae and is most closely related to carps and catfishes. They have a generally symmetrical and streamlined appearance, with a sizable forked caudal fin. They live in the warm waters along the continental shelves and around islands in the Indo-Pacific. They are easy to grow as long as you have the resources. Their fingerlings are 10-17mm long 2 weeks after hatching from eggs. Five years after hatching, they mature sexually and are able to reproduce. They grow up to 1.5 meters long and weigh up to 20 kilograms. They become an adult after 5-6 years but they are marketable 6-9 months after hatching from their eggs and weigh 200-300 grams. They thrive best in brackish

water areas, in which fresh and salty water is mixed. They have no teeth, and generally feed on algae and invertebrates.

The milkfish is one of the most important food fish throughout Southeast Asia and much of the Pacific. They are an important species for aquaculture in some areas of the Far East. Being a plankton feeder, the diet of the milkfish is either supplied wholly by natural productivity or is fed with particular diets. Milkfish is a warm water species and prefers water temperatures between 20-33 degrees Celsius. Unlike many other large saltwater fish it is herbivorous and feeds on cyanophyta, diatoms and other similar food items.

One advantage in the business of growing milkfish is that it can be bred in captivity. With the milkfish culture industry expanding all over Philippines, there is a growing need to establish hatcheries to produce milkfish fingerlings to meet the requirements of aquaculture operators. The business of growing and selling milkfish fingerlings is a profitable one since many Filipinos enjoy milkfish as a delicacy like milkfish in sour broth and grilled bangus. Milkfish are relatively simple to farm. They grow up quickly and are relatively immune to illnesses. There are only a few things needed in this business. These things that are required are the facility or place where

you would grow and feed your milkfish fingerlings, milkfish fingerlings, water for the fingerlings, and the feed for the fingerlings. The influence of seasons, currents, tides shore profile and proximity to inland waters on the occurrence and abundance of milkfish fry in shore waters have been studied by several investigators (Kumagai, 1984).

This study aims to find a better diet for milkfish fingerlings. A more nutritious diet would make a healthier and bigger milkfish and would increase the sale and profit of a milkfish hatchery owner. There are only two diets to be compared in this study, commercial feed and rotifer diet. The factors to be observed for the results of this study are the growth in length, size and weight of the milkfish fingerlings after three months of feeding them with the said diets.

The researchers choose this study to find a better diet for milkfish fingerlings for people who run businesses concerning the growing and production of milkfish fingerlings. One major factor in determining the quality of milkfish that an owner of this business produces is the diet he or she uses to for his or her fingerlings. This study would have an effect on the said business by improving the way they grow their milkfish with diets they use.

The diets, rotifer and commercial feed, were chosen to compare the growth of milkfish fingerlings with natural and artificial diets. The rotifer diet will be used as the natural diet and commercial feed diet as the artificial diet.

Bangus or milkfish is the Philippines' most important food fish cultured in brackish water ponds and freshwater pens. There are an estimated 176,000 hectares of water pens in the country producing milkfish. Aside from grow-out forms, the gathering and rearing of milkfish is a multi-million peso industry by itself that provides livelihood and income to thousands of small fisherfolks (Guerrera, 1990).

Statement of the Problem and the Hypothesis

This study will determine the growth potentials of milkfish fingerlings when fed with rotifer and commercial feed diet. Specifically, it sought to answer the following questions:

1. What is the (a)mean length and (b)mean weight of milkfish fingerlings when fed with (1)rotifer and (2)commercial feed diet after three months?

2. Is there a significant difference in the (a)length and (b)weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months?

It is hypothesized that there is no significant difference in the (a)length and (b)weight of milkfish fingerlings when fed with (1)rotifer and (2) commercial feed diet after three months.

Paradigm

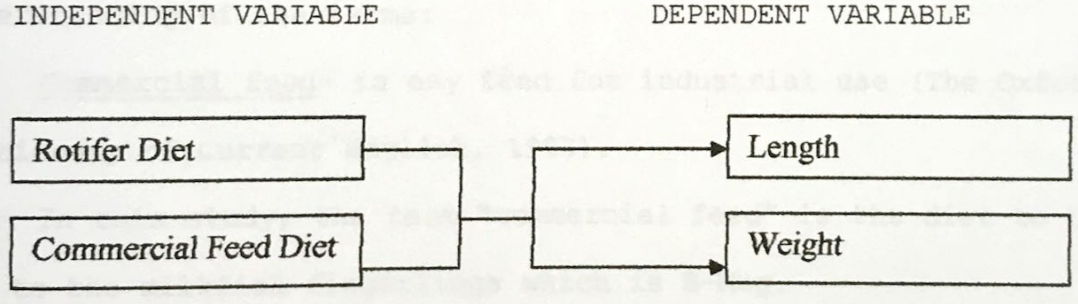

Figure 1. A comparison on the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months.

Significance of the Study

Results of this study hopes to provide benefits to the following groups of people.

Milkfish fingerling hatchery owners. The outcome of this study would let these people know which feed will produce healthier milkfish fingerlings or save more money.

Consumers of milkfish fingerlings. The outcome of this study would affect the quality of the food supply of these people.

Definition of Terms

The following terms have been given their conceptual and operational meaning to ensure clarity of ideas and better understanding of the terms:

Commercial feed- is any feed for industrial use (The Oxford Dictionary of Current English, 1993).

In this study, the term "commercial feed" is the diet to be fed to the milkfish fingerlings which is B-Meg.

Length- is a measure of distance or duration of time (Microsoft Encarta Encyclopedia Deluxe Dictionary, 2001).

In this study, the term "length" means the horizontal growth of the milkfish fingerling from its mouth to its tail.

Milkfish- is a silvery marine food fish that is the only living member of the family Chanidae (Britannica Deluxe Edition, 2002).

In this study, the term "milkfish" is the basis for the results of our study.

Rotifer- is any of a phylum of multicellular, generally microscopic, aquatic animals that are abundant worldwide, and is most frequently found in freshwater bogs, ponds, and puddles (Microsoft Encarta Encyclopedia Deluxe Dictionary, 2001).

In this study, the term "rotifer" is the diet to be fed to the milkfish fingerlings.

Weight- is the measure of the gravitational force exerted on an object (Microsoft Encarta Encyclopedia Deluxe Dictionary, 2001).

In this study, the term "weight" is the growth in mass of the fingerling.

Scope and Delimitation

The objective of this study is to show which diet would have a better effect on the length and weight of milkfish fingerlings. This study is only limited to comparing rotifer and commercial feed diets. In order to determine the more advantageous diet, the researchers will have a control group in which the milkfish fingerlings will feed on the rotifer that is found naturally on the water of the aquariums. The results that would show the effects of these diets would be length and weight of the fingerlings after three months.

The study will be conducted at a milkfish hatchery in Barangay Loboc, La Paz Iloilo City. The researchers would first separate the fingerlings into 2 main groups which would be fed with the different diets. Each main group will be divided into 3 more groups to ensure consistency of data. Each of these groups will be placed in separate aquariums. The first group will be fed with rotifer diet and the second group with commercial feed diet. The researchers will monitor the changes in length and weight of the fingerlings periodically from October 2004 to December 2004.

Chapter 2

Review of Related Literature

This chapter consists of two topics, namely, (1) Rotifer and (2) Milkfish

Rotifer

Rotifer, any of a phylum of multicellular, generally microscopic, aquatic animals that are abundant throughout the world, and are most frequently found in freshwater bogs, ponds, and puddles. Rotifers vary in shape but always have retractable, hair-like crowns of cilia that, in motion, resemble turning wheel. Among the first microscopic life forms to be studied, they were commonly known as wheel animacules. The animals can attach themselves temporarily to surfaces by means of a cementing secretion from the "foot" of the body. They reproduce sexually, but males are rare; except under severe conditions, the eggs develop parthenogenetically. Rotifers feed on other micro-organisms; a few species are parasitic (Microsoft Encarta Encyclopedia, 2002).

Each rotifer has a head bearing a crown of cilia, the corona, at the anterior end; most rotifers feed with the aid of currents generated by the coronal cilia. A posterior foot, often equipped with two or three toes, contains adhesive glands permitting temporary attachments to objects. Unique grinding jaws are found in the pharynx, and an esophagus, stomach, and intestine can be distinguished. The excretory system consists of ciliated cells, called flame cells that move collected liquids into two coiled tubes called protonephridia; these tubes open into a contractile bladder. The reproductive system is simple, consisting in the female of ovary, yolk gland, and oviduct, and in the male of testis and sperm duct. The intestine, bladder, and reproductive ducts unite to form a cloaca. Rotifers, of which there are about 1,500 known species, are widely distributed in freshwater and marine habitats; they also live in the soil, in mosses, and associated with lichens on rocks and trees. A few are parasitic. Most feed on bacteria, algal cells, small protozoans, or organic detritus. As a rule, only female rotifers are seen; in some species the males have never been observed. Diploid eggs develop parthenogenetically, i.e., without fertilization, to produce females. Under some conditions, haploid eggs are produced; these develop parthenogenetically into

males or can be fertilized, developing into dormant state and becoming active when moisture is available (Encyclopedia, 2004).

Rotifers are microscopic aquatic animals of the phylum Rotifera. Rotifers can be found in many freshwater environments and in moist soil, where they inhabit the thin films of water that are formed around soil particles. The habitat of rotifers may include still water environments, such as lake bottoms, as well as flowing water environments, such as rivers or streams. Rotifers are also commonly found on mosses and lichens growing in tree trunks and rocks, in rain gutters and puddles, in soil or leaf litter, on mushrooms growing near dead trees, in tanks of sewage treatment plants, and even on freshwater crustaceans and aquatic insect larvae (Orstan, 1999).

The name "rotifer" is derived from the Latin word meaning "wheel-bearer"; this makes reference to the crown of the cilia around the mouth of the rotifer. The rapid movement of the cilia in some species makes them appear to whirl like a wheel (Kirk, 1999).

The rotifers a phylum of mircoscopic pseudocoelomate animals. Most rotifers are around 0.1-0.5 mm long, and are common in freshwater throughout the world with a few saltwater species (wikipedia, 2004).

Rotifers are valuable live food for larval fish and crustacean culture. Several characteristics of rotifers, including their nutritional quality, body size and relatively slow motility have contributed to their usefulness as good prey for active larvae (Snell and Carillo, 1984).

Milkfish

Milkfish have a generally symmetrical and streamlined appearance, with a sizable caudal fin. They can grow to 1.7 m, but are most often about 1 meter in length. They have no teeth, and generally feed on algae and invertebrates.

They occur in the Indian Ocean and across the Pacific Ocean, tending to school around coasts and islands with reefs. The youngest larvae live at sea for 2-3 weeks, the migrate to mangrove swamps, estuaries, and sometimes lakes, returning to sea to mature sexually and reproduce.

The larvae are collected from rivers and raised in ponds, where they can be fed almost anything and grow very quickly, then are sold fresh, frozen, canned, or smoked (Pfeil, 1996).

Filipinos have a very special relationship to the milkfish or bangus. It is at the very top of diet regardless whether

people are rich or poor. The demand exceeds the offer. Although present in the entire indo-pacific area with water temperatures above 20 degrees, the milkfish belongs to the national symbols of the Philippines and it appears in folk tales as "king of fish". Currently, it contributes with 217,000 tons approximately seven percent of the national fish production. Considering the decline of fisheries in the most important fishing-regions in the world, its aqua farming gets higher priority with regard to a cheap protein-supply of the population (Bethge, 2002).

Milkfish or bangus is the leading commercial species in the aquaculture industry. It can be cultivated in brackishwater, marine and freshwater areas, in ponds, pens, and cages. Milkfish lay up to several million eggs in shallow, brackishwater from the months of March to May (Agri-Food Trade Service, 2001).

Milkfish is a very important fish for people living in Southeast Asia. Facing market demands, people in Indonesia, Philippines and Taiwan use several hundred thousand of hectares of lands to grow milkfish. This large growing activities use large numbers of young milkfish fingerlings.

In the past, this large numbers of fingerlings were met by captured wild fingerlings. After the wild fingerlings were depleted in many areas, in the past twenty years, large milkfish

males and females, maintained in ponds or net-cages, have been used to reproduce the high needed fingerlings.

Milkfish have been bred with hormone injections and hand stripping for eggs and sperm. However, natural breeding occurring in coastal ponds proves to be a better method for obtaining large sums of high-quality fertilized eggs (Hsiao and Tseng, 1980).

A large silvery fish of the South Pacific and Indian oceans, widely used for food (The American Heritage Dictionary of the English Language: Fourth Edition, 2000).

It was once believed that the fishes of the world's oceans were inexhaustible. This error of thinking by fishers has caused a reduction of numerous fish populations to extreme low level, destabilized marine ecosystems, decreased biodiversity, and impoverished many coastal communities. We humans are exacerbating the problem by continuing to degrade and deplete the ocean's habitat and resources. Fisheries are extracting fish from the oceans at a greater rate than the number produced. As populations increase, the demand for fish increases as well. Because wild fish regenerate at rates determined by nature, attempts to increase their supply to the marketplace must eventually run into limits (Safina, 1995).

Adult Milkfish occur in a variety of habitats, from shallow inner lagoons to the outer reef slope. The spawning season varies from place to place. In Palau they spawn beyond the edge of the reef near the sea surface a few days around both full and new moons. Females produce up to several million eggs which hatch in a few days. Fry 10-14 days old enter brackish waters. They feed on benthic algae and its associated invertebrate fauna (Amesbury and Myers, 2001).

Fossils of this fish date from as far back as the Cretaceous Period (144 to 66.4 million years ago). The milkfish is often collected when young and raised for food in brackish or freshwater tropical ponds (Britannica Deluxe Edition, 2002).

Variable results were obtained when artificial diets were fed to milkfish in ponds. Fish pellets (37.4% crude protein) considerably increased fish production compared to lab-lab or plankton as the main food for the milkfish (Fortes, 1984). On the other hand, commercial chick starter pellets (21% crude protein) used as a supplementary diet for milkfish fingerlings (16.3% g body weight) did not significantly increase growth, survival and production of milkfish in fertilized ponds (Otubusin and Lim, 1985). Undoubtedly, the effectiveness of an artificial diet in enhancing fish production quality of the diet, stocking

rate or fish biomass and the level of fertilization or natural food production, among others.

Milkfish is common throughout the Pacific Island from Guam to Tuamoto and from Hawaii to Tonga. Milkfish occurs in New Guinea, the Solomon Island and around the western, northern and eastern coast of Australia (Bagarinao, 1996).

Milkfish apparently stay relatively close to island and continental shelves; they have not been recorded in catches of Oceanic Fishing Fleets. Distribution seems to be limited to waters with temperate water affected by warm oceanic currents (Patron, Naquita, Tendencia, 1998).

Chapter 3

Research Design and Methodology

This study aimed to design a simple experiment to compare the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diet for three months.

It is hypothesized that there is no significant difference in the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months.

Research Design

The milkfish fingerlings were divided into two groups, one fed with rotifer and the other with commercial feed diet. Each group had three setups to ensure the consistency of data. Each setup was composed of 30 milkfish fingerlings. The fingerlings were placed in aquariums.

The fingerlings were fed twice daily for a period of three months with their respective diets according to 10 percent of their body weight. Each day, the water in each aquarium was replaced with new water. We monitored the changes every month from October 2004 to December 2004.

The materials needed were 6 aquariums, 180 milkfish fingerlings, fresh water, rotifer, commercial feed, length measuring board, and a weighing scale.

Gathering of Materials

The aquariums, length measuring board, and weighing scale were borrowed from a Fisherist professor from UPV. The rotifer, commercial feed, and milkfish fingerlings were aquaried in stores. The milkfish fingerlings were from the same mother.

Preparation of the Set-ups

There were six set-ups. Each set-up had one aquarium and was filled with fresh water and 30 milkfish fingerlings. Three set-ups were fed with rotifer diet and the other three were fed with commercial feed diet.

Feeding of the milkfish fingerlings

The amount of each diet fed to the fingerlings in each set-up depended on the total weight of all milkfish fingerlings in one set-up. The fingerlings were fed twice daily with their respective diet.

Determining the Length and Weight

In determining the length of the fingerlings, we used a length measuring board. In determining the weight of the fingerlings, we used a weighing scale.

Statistical Data Analysis

Data gathered from this study were treated statistically, with the mean as descriptive statistical tool.

Mean

The mean was employed to express the average of all values from the different determinations.

T-test

The t-test was employed to determine if there is a significant difference in the length, size, and weight of the milkfish fingerlings.

Chapter 4

Results and Discussion

This study compared the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diets.

It specifically determined the mean length and mean weight of milkfish fingerlings when fed with rotifer and commercial feed diet for three months. It also determined if there was a significant difference in the mean length and mean weight of milkfish fingerlings when fed with rotifer and commercial feed diet. The results of the fingerlings fed with rotifer diet and the results of the fingerlings fed with commercial feed diet were compared using the means of their results.

It is hypothesized that there exists no significant difference in the length, size, and weight of milkfish fingerlings when fed with rotifer and commercial feed diets.

Length and weight of milkfish fingerlings after being fed with rotifer and commercial feed diet for three months

The growth in length of the milkfish fingerlings after three months of being fed with their respective diet revealed that commercial feed diet grew longer fingerlings (mean length of

21.58 centimeters) than rotifer diet (mean length of 21.49). Commercial feed diet also yielded heavier fingerlings (mean weight of 153.27 grams) than rotifer diet (152.30 grams).

This shows that commercial feed diet has more nutrients that are absorbed by the fingerlings than rotifer diet after a period of three months.

Table 1.0 and 2.0 show the data.

Table 1.0

Summary of Results

	First Month		Second Month		Third Month	
	Length (mean)	Weight (mean)	Length (mean)	Weight (mean)	Length (mean)	Weight (mean)
Rotifer Diet	9.78 cm	46.57 grams	16.33 cm	87.17 grams	21.49 cm	152.30 grams
Commercial Feed Diet	9.78 cm	46.50 grams	16.46 cm	87.53 grams	21.58 cm	153.27 grams

Table 2.0

A comparison on the length and weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months

	FEEDS	N	mean	sd	t	df	Sig
Length	Rotifer	30	21.49	0.59	-0.594	58	0.555
	Commercial Feed	*30*	21.58	*0.54*	*-0.594*	58	*0.555*
Weight	Rotifer	30	152.30	4.53	-0.955	58	0.344
	Commercial Feed	*30*	153.27	*3.20*	*-0.955*	52.234	*0.344*

Chapter 5

Summary, Conclusions and Recommendations

This study aimed to determine the growth potentials of milkfish fingerlings when fed with rotifer and commercial feed diet. Specifically, it sought to answer the following questions:

1. What is the (a)mean length and (b)mean weight of milkfish fingerlings when fed with (1)rotifer and (2)commercial feed diet after three months?

2. Is there a significant difference in the (1)length, and (2)weight of milkfish fingerlings when fed with rotifer and commercial feed diet after three months?

It is hypothesized that there is no significant difference in the (a)mean length and (b)mean weight of milkfish fingerlings when fed with (1)rotifer and (2) commercial feed diet after three months.

Summary

1.1.a The mean length of milkfish fingerlings when fed with rotifer diet after three months was 21.49 centimeters.

1.1.b The mean weight of milkfish fingerlings when fed with rotifer diet after three months was 152.30 grams.

1.2.a The mean length of milkfish fingerlings when fed with commercial feed diet after three months was 21.58 centimeters.

1.2.b The mean weight of milkfish fingerlings when fed with commercial feed diet after three months was 153.27 grams.

2.1 The significant difference in the length of the fingerlings when fed with rotifer and commercial feed diet after three months was 0.555 as the t-test shows. There is no significant difference.

2.2 The significant difference in the weight of the fingerlings when fed with rotifer and commercial feed diet after three months was 0.344 as the t-test shows. There is no significant difference.

Conclusions

Commercial feed diet produces longer and heavier fingerlings than rotifer diet after a period of three months. However, there was no significant difference in the length and weight of the fingerlings after a period of three months even

when the commercial feed diet produced longer and heavier fingerlings as the test shows in table 2.0.

The researchers conclude that using commercial feed produces longer and heavier milkfish fingerlings after three months. However, commercial feed diet is more expensive than rotifer diet. It is advised that people, who are just starting their milkfish hatchery business, use rotifer diet since it is cheaper and yields almost the same with rotifer diet.

Recommendations

It is recommended that further studies be conducted with other cultured fish such as tilapia. Further studies should be conducted using other diets. It is also recommended that further studies determine the nutrients found in rotifer and commercial feeds.

Appendix A

Results after the first month of feeding

Length (Centimeters)		Weight (Grams)	
Rotifer Diet	Commercial Feed Diet	Rotifer Diet	Commercial Feed Diet
9.3	10.0	45	49
9.8	9.7	46	46
9.5	9.6	48	45
10.3	9.8	52	44
9.5	9.7	46	47
9.8	9.9	48	48
9.9	9.8	49	41
9.7	9.7	42	44
9.8	9.7	49	45
9.6	9.8	45	48
9.8	9.6	46	46
9.7	9.7	47	43
9.7	9.8	48	49
9.7	9.9	48	56
9.9	9.8	49	50
9.8	9.8	47	48
9.8	9.7	50	46
10.1	9.8	48	47
9.8	9.7	47	47
9.9	9.9	48	48
9.7	9.6	47	45
9.8	9.8	42	47
10.2	9.7	46	44
9.4	9.7	41	41
9.7	10.1	48	45
9.8	9.7	42	49
9.9	9.6	46	48
9.8	10.2	42	47
9.8	9.8	48	48
9.8	9.7	47	44

Appendix B

Results after the second month of feeding

Length (Centimeters)		Weight (Grams)	
Rotifer Diet	Commercial Feed Diet	Rotifer Diet	Commercial Feed Diet
15.7	15.9	82	84
15.6	15.7	83	85
17.5	16.6	93	84
16.4	15.9	86	85
15.6	15.7	84	86
16.8	16.5	89	88
15.7	16.0	84	90
16.7	15.9	86	88
16.4	15.7	88	87
16.6	15.7	87	87
15.9	16.2	84	83
15.7	16.7	86	84
15.3	15.8	82	95
17.4	16.9	98	86
16.9	16.2	84	82
17.6	15.6	97	82
15.9	17.2	84	80
16.0	15.2	86	81
15.7	15.9	87	85
15.8	17.4	86	95
16.3	17.6	89	99
16.9	16.6	89	86
16.7	17.0	87	95
16.8	17.2	85	96
16.8	17.4	89	84
15.5	16.8	84	87
15.6	17.5	86	98
15.8	17.8	81	84
17.4	16.8	96	91
17.0	16.5	93	89

Appendix C

Results after the third month of feeding

Length (Centimeters)		Weight (Grams)	
Rotifer Diet	Commercial Feed Diet	Rotifer Diet	Commercial Feed Diet
21.6	21.6	154	151
21.4	22.4	155	160
21.3	20.4	153	148
21.8	21.5	154	150
21.5	21.6	152	152
22.5	21.7	154	151
20.6	22.7	145	156
21.5	21.6	156	153
21.6	21.5	155	154
21.8	21.3	157	152
21.4	21.4	153	153
21.1	22.0	154	158
22.4	21.7	162	153
21.5	20.5	156	147
20.4	21.7	148	153
21.6	21.8	153	158
21.5	21.6	152	157
21.4	22.7	154	158
21.5	21.0	151	152
21.8	20.6	154	146
20.6	21.7	146	154
20.4	21.8	143	154
20.9	21.4	145	152
20.9	21.5	144	153
21.0	21.6	148	154
21.6	21.4	150	155
21.8	21.3	151	154
22.4	21.4	154	152
22.5	22.5	159	156
22.4	21.5	157	152

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