Sponsored Research Agreement #V210404

This sponsored research agreement is effective the date of last signature and is between the Regents of the University of Idaho, a public university of the state of Idaho ("**University**") and Beta Hatch, a state of Washington corporation ("**Sponsor**").

The parties enter into this agreement to carry out the project described in Attachment A under University's control and direction ("**Research Project**"). The Research Project will further University's mission to provide instruction, research, and public service to the benefit of the state of Idaho. This agreement is specific to the Research Project and will not necessarily be used as precedent for other projects between the parties.

University and Sponsor therefore agree as follows:

1. **Performance Period**
   Work on the Research Project shall begin on 1 July 2021 and will end 31 December 2021 ("**Performance Period**").

2. **Compensation & Expenses**
   a. Sponsor shall pay University **$58,527** for work done during the Performance Period after this agreement is signed and an invoice is received from University.

   b. Payment shall be made no more than 30 days after receipt of the invoice. University may stop work if payment is not received by 30 days or charge interest on any outstanding balance owed. Sponsor shall make payment to University by check to the following address: *Regents of the University of Idaho, ATTN: Office of Sponsored Programs, 875 Perimeter Drive, MS 3020, Moscow, ID 83844-3020*.

   c. Any questions about compensation or expenses shall be sent to the party's Financial Contact listed in Attachment B.

   d. University is not obligated to incur costs greater than the amount listed in Section 2.a above. Sponsor's rights under Section 4 are subject to Sponsor fulfilling its obligations under this Section 2.

3. **Intellectual Property Ownership**
   a. University hereby owns all inventions or discoveries conceived and first reduced to practice solely by University employees or students in performance of the Research Project ("**University Sole Intellectual Property**").

   b. Sponsor hereby owns all inventions or discoveries conceived and first reduced to practice solely by Sponsor employees in performance of the Research Project ("**Sponsor Sole Intellectual Property**").

   c. University and Sponsor hereby jointly own all inventions or discoveries conceived and first reduced to practice jointly by University and Sponsor employees or students in performance of the Research Project ("**Joint Intellectual Property**").

   d. This agreement does not grant any ownership rights to intellectual property other than the rights stated above.

4. **Intellectual Property Licensing**
   a. University hereby grants Sponsor a license to University Sole Intellectual Property for its internal research purposes.

   b. University hereby grants Sponsor a time-limited option to negotiate an exclusive or non-exclusive license for a specific field of use to University Sole Intellectual Property or University's interest in Joint Intellectual Property ("**Sponsor Option**"). The license shall be subject to any existing third-party rights. The terms of the Sponsor Option are as follows:
      i. The Sponsor Option shall start on the day University's Office of Technology Transfer contact discloses University Sole Intellectual Property to Sponsor's Technology contract. The contacts are listed in

Attachment B. Sponsor shall have 90 days to send University a written request to license any University Sole Intellectual Property.

ii. After University receives Sponsor's written request to license University Sole Intellectual Property or University's interest in Joint Intellectual Property, the parties shall have 90 days to negotiate a license agreement. The 90-day period to negotiate the license agreement shall begin on the day the University receives the written request.

iii. University is not required to license University's Sole Intellectual Property or University's interest in Joint Intellectual Property to Sponsor if a license agreement is not executed within 90 days.

iv. Any license granted to Sponsor under Section 4.b will be subject to University's retention of rights to use, have used, make, or have made the licensed invention or discovery for research and educational purposes, whether alone or with one or more third parties.

c. Sponsor hereby grants University a royalty-free, non-exclusive license to use Sponsor Sole Intellectual Property for University's internal academic and research purposes.

d. A party shall not invoke the Cooperative Research and Technology Enhancement (CREATE) Act of 2004, P.L. 108-453, without prior written consent from the other party. Any written consent must specifically reference the invention the CREATE Act is being invoked for.

5. Standard of Care

University shall use reasonable efforts to perform the Research Project. University does not state that the desired results shall be obtained. University shall not be required to perform the Research Project in violation of any university policies or any applicable laws and regulations.

6. **Confidentiality**

a. Subject to section 6(d), information will be treated as confidential if it is (1) in written, graphic, or tangible form, or reduced to such form within 30 days of disclosure and (2) clearly marked with a stamp or legend, such as "Proprietary Information" or "Confidential Information."

b. Confidential information will only be used as required to perform the Research Project. Each party shall use reasonable efforts to avoid disclosing confidential information to third parties unless written approval is given by the other party. Neither party shall be liable for disclosing confidential information if the party exercised reasonable care and had reasonable controls in place to protect the confidential information. The receiving party shall keep confidential information confidential for three years from the date of disclosure.

c. Confidential information will only be disclosed to staff members who (1) have a legitimate business need to know, (2) are required to accomplish the Research Project, or (3) must exercise a party's rights under this agreement. But either party may disclose confidential information to its affiliates, contractors, consultants, or students if it is necessary to complete the Research Project and if such individuals have signed a written confidentiality agreement no less restrictive than the terms in this agreement.

d. Information is not confidential information if it is:

i. Required to be disclosed under court order or operation of law, including the Idaho Public Records Law, Idaho Code §§ 74-101 thru 74-126;

ii. Reasonably ascertained by either party to create a risk to a trial subject or public health and safety;

iii. Published or otherwise in the public domain thru no fault of the receiving party;

iv. In the receiving party's possession before receipt from the disclosing party under this agreement;

v. Obtained by the receiving party from a third party without restriction on disclosure to another party;

vi. Independently developed by receiving party's staff members or employees who did not have direct or indirect access to the information; or

vii. Disclosed by the receiving party to a third party with the disclosing party's written approval and without restriction.

e. Neither party gives any express or implied guarantee that information furnished under this agreement is adequate, accurate, sufficient, or free from defects or that the use or reproduction of any information shall be free from any patent, trade secret, trademark, or copyright infringement. Neither party shall be liable for any damages, costs, expenses, risks, or liabilities because of their receipt, use, or reliance on any information furnished under this agreement.

f. At the request of the disclosing party, the receiving party shall promptly return or destroy all confidential information provided by the disclosing party and any copies made by the receiving party. However, the receiving party shall have the right to retain one copy of confidential information for record purposes only.

7. Publication

a. University may publish or disclose the Research Project results ("**Publication**"). University shall exercise reasonable care that no Publication releases Sponsor's confidential information without Sponsor's written approval. University may catalog and place reports of the Research Project that do not contain Sponsor's Confidential information in the University library so that the results are available to the interested public.

b. University shall give Sponsor's Technical Contact a copy of any proposed Publication 30 days before the proposed publication or disclosure. Sponsor may review the Publication for Sponsor's confidential information and request University to delete references to Sponsor's confidential information. Sponsor's right to review Publications shall expire 12 months after the Research Project ends.

c. Sponsor may request University to delay Publication for 60 days if it identifies patentable subject matter in the Publication. To request the delay, Sponsor must send written notice to the University's Office of Technology Transfer Contact (see Attachment B) with a copy to the University's Principal Investigator. University shall cooperate to give the appropriate party time to file patent applications. The party filing patent applications shall give the other party notice of its intent to file a patent at least 15 days before filing the application.

8. Liability

a. Each party shall be responsible only for the acts, omissions, or negligence caused by that party's own employees or agents. Nothing in this agreement shall extend the tort liability of the State of Idaho beyond that required by law, including for the state of Idaho the Idaho Tort Claims Act, Idaho Code §6-901, et seq.

b. Each party shall be responsible for damage to property of the other party caused by its employees or agents in performance of this agreement. Because University is a state entity and subject to state appropriation laws, any property claim or damage arising from the University's employees or agents that is not covered by the University's self-insurance or other property coverage shall be paid to the extent funds are legally available.

c. Insurance. Insurance requirements in the agreement may be evidenced by a Certificate of Financial Responsibility or Certificate of Insurance. If any coverage required by the agreement is provided by private insurers or quasi-government entities regulated under applicable insurance codes or laws, the insured party shall provide coverage and evidence of coverages upon request.

d. **Sponsor Liability**. Sponsor shall maintain comprehensive general liability and professional insurance coverage during the term of this Agreement. Sponsor's coverage limits shall not be less than $1 million per occurrence

and $3 million annual aggregate. Sponsor shall provide proof of insurance or loss coverage when requested by University. Sponsor certifies that it has workers compensation insurance as required by applicable state law and shall provide proof upon request.

9. Reports

University shall provide the following reports to Sponsor: (*Check appropriate box or boxes*)

☐ a final report on the results of the Research Projects due no later than 90 days after the Performance Period ends.

☐ progress reports: (select one) ☐ quarterly or ☐ annually.

10. Equipment

University owns any equipment and materials it purchases, acquires, or fabricates with funds provided by Sponsor and as authorized by the agreement. University shall not own any equipment or materials that are expressly part of a deliverable to Sponsor.

11. Publicity

Each party shall obtain written authorization from the other party before publishing any promotional materials that use the other party's name or trademarks. However, University may, without Sponsor's written authorization, disclose Sponsor's name and the Research Project title as required or permitted by law. This section will survive termination of this agreement.

12. Disclaimer

The Research Project is strictly experimental. University makes no warranties of any kind, express or implied, including warranties of merchantability, fitness for a particular purpose, or non-infringement of any third-party intellectual property rights, regarding the Research Project, research results, the University Intellectual Property, Joint Intellectual Property, or other results.

13. Termination

Either party may terminate this agreement for any reason by giving the other party prior written Official Notice. The prior written Official Notice must be given at least 30 days before the date the termination takes effect. Upon termination by either party, Sponsor shall pay University any costs that were encumbered up to the termination date and any non-cancelable commitments, including without limitation tuition and fees.

14. Official Notices

Official Notices required by this agreement must be in writing to the party's Administrative Contact listed in Attachment B and delivered via Certified Mail with postage prepaid or by email with a delivery notification. Any notice not sent as required above shall not be considered an Official Notice.

15. Export Controls

a. The parties shall comply with all applicable export control laws or regulations. Sponsor shall give the University Export Control Contact listed in Attachment B 15 days' prior written notice if Sponsor intends to deliver any information, data, materials, equipment, software, or technology that is export controlled.

b. Sponsor shall obtain any required authorizations from the US Government before it transfers or exports any information, data, material, equipment, software, or technology to University that is export controlled.

c. University is not required to accept export-controlled information. University may manage or alter the Research Project, as stated in Section 20, so that an export or import license is not required.

16. Independent Contractors

University and Sponsor are independent contractors. This agreement does not create a partnership, agency, or joint venture between the parties for any purpose. Each party shall be responsible for its personnel's wages, hours, benefits, insurance, and employment conditions.

17. **Governing Law & Jurisdiction**
Idaho law governs all questions about validity, interpretation, or construction of this agreement. The parties hereby submit to the jurisdiction of the courts of the state of Idaho for any action arising from this agreement.

18. **No Waiver or Severability**
No waiver will be effective unless it is in writing and signed by the Authorized Contact (see Attachment B) of the party granting the waiver. A waiver granted on one occasion will not operate as a waiver on other occasions.

19. **Entire Agreement**
This agreement is the entire agreement between the parties and merges all prior discussions between the parties. Neither party shall be bound by any conditions, definitions, warranties, understandings, nor representations that are not expressly included in this agreement.

20. **Amendment**
This agreement may only be modified by a written amendment executed by the parties' Authorized Contacts. Any purchase order or similar document shall not change or add to the terms and conditions of this agreement.

21. **Non-Assignment; No Third-Party Beneficiaries.** Neither party may assign this Agreement. This agreement does not give any interest or rights to any third parties.

22. **Order of Precedence**
Any conflict in the terms of this agreement shall be resolved by giving priority in the following order: (1) this agreement, (2) Attachment A, and (3) Attachment B.

23. **Sovereign Immunity**
Nothing in this agreement requires University or the state of Idaho to waive or limit its sovereign immunity.

Each party is signing this agreement on the date stated opposite that party's signature.

SPONSOR

Date: July 1 2021

By: Virginia Emery Digitally signed by Virginia Emery Date: 2021.07.01 10:20:44 -07'00'

Name: Virginia Emery

Title: President

UNIVERSITY

Date: [See signature.]

By: Deborah N. Shaver, CRA Digitally signed by Deborah N. Shaver, CRA Date: 2021.07.01 16:00:10 -07'00'

Name: Deborah N. Shaver

Title: Assistant VP Research Admin.

lh 06.30.2021

Attachment A – RESEARCH PROJECT

Title: Evaluation of meal worm protein digestibility and efficacy as a fish meal replacement for rainbow trout

Sponsor:
Aimee Rudolph, VP Business Development Beta Hatch
200 Titchenal Rd, Suite 1
Cashmere, WA. 98815
206-488-4762
aimee@betahatch.com

PI:
Dr. Brian C. Small, Director Aquaculture Research Institute University of Idaho
208-837-9096 ext.1108
bcsmall@uidaho.edu

Veterinarian:
Dr. Steven Russell Attending Veterinarian University of Idaho 208-885-8958
campusvet@uidaho.edu

Estimate: $63,748

Statement of Work:
The overall aim of the proposed project is to evaluate Beta Hatch defatted mealworms (DMW) fed to rainbow trout for use in commercial aquaculture.

The specific objectives of this study are to:

- To evaluate the diet, nutrient and energy digestibility of defatted mealworms (DMW) fed to rainbow trout as part of a complete feed.
- To evaluate growth performance and health of rainbow trout fed five diets containing graded levels of DMW (0, 25, 50, 75, 100% fishmeal replacement).

Work Plan and Research Approach
The use of experimental animals will be according to the scientific research and animal care and use protocols of the University of Idaho, which comply with all relevant local and/or international animal welfare laws, guidelines and policies. Institutional Animal Care and Use protocol number and study approval memo will be provided upon approval and prior to start of the study.

Experimental procedures for fish feeding trial
Beta Hatch will supply the DMW for the digestibility trial and production of the five dietary treatments to be used in a feeding trial with rainbow trout. Preliminary proximate composition of DMW ins shown in Table 1. All fish work will be performed at the University of Idaho Hagerman Fish Culture Experiment Station, Hagerman, Idaho. A diagram of tanks and treatments will be provided upon assignment and in the final report. The project will consist of a digestibility trial and a growth trial using rainbow trout. The trials will be preceded by chemical analysis of feeds and protein ingredients, including proximate composition, energy content, and amino acid composition.

Trout digestibility trial:
In vivo digestibility of DMW will be determined following feeding to rainbow trout. A reference diet (Table 2) containing practical ingredients and 0.1% indigestible inert marker (yttrium oxide) will be prepared, with which a test diet containing 30% test ingredient and 70% reference diet mash on dry-matter basis will prepared. Samples of DMW ingredient, diet and respective feces will be analyzed for proximate composition, energy and amino acid content. Digestibility of macro-nutrients, energy and amino acids will be calculated according to standard methods.

Rainbow trout sourced as eggs from a commercial supplier and reared to approximately 200 ± 20 g average weight will be used in this study. At stocking, groups of 30 fish will be placed into 8 145-L tanks supplied with constant temperature (15°C) spring water. The experimental diet and the control diet will be fed in replicate to four tanks of fish. Photoperiod will be maintained at a constant 14 h light: 10 h dark with timer-controlled fluorescent lights. Fish will be fed their respective diets twice daily to

apparent satiation for one week. Apparent satiation will be achieved by offering small quantities of feed to the fish by hand until feeding activity stopped. During week two, fish in each tank will be lightly anaesthetized using tricaine methanesulfonate (MS-222, 100 mg L-1, buffered to pH 7.0), removed from water for 20-30 seconds, and feces gently expelled using light pressure on the abdomen near the vent, a process called stripping. Feces will be collected in aluminum pans and pooled by tank. Fish will be stripped at intervals of 3-4 days until sufficient fecal samples are obtained. Feces will be frozen between stripping collections. Fecal samples will be analyzed for marker and nutrient composition. Apparent digestibility coefficients (ADC) will be calculated for dry matter, protein, lipid, energy, and amino acids.

Sample collection and analysis:
Feed and fecal samples will be finely ground by mortar and pestle. Proximate composition of ingredients, feed and fecal samples will be determined using AOAC (1990) procedures. Briefly, samples will be dried in a convection oven at 105°C for 12 h to determine moisture level. Samples will be analyzed for crude protein (total nitrogen × 6.25) using the combustion method (AOAC 990.03) with a nitrogen determinator (Elementar nitrogen analyzer, Ronkonkoma, NY). Crude lipid will be analyzed using an ANKOM XT15 extractor (AOCS Am 5-04; ANKOM Technology, Macedon, NY) with petroleum ether as the extracting solvent, and ash by incineration at 550 °C in a muffle furnace for 5 hr (AOAC 942.05). Energy content of samples will be determined using an isoperibol bomb calorimeter (Parr 6300, Parr Instrument Company Inc., Moline, IL). Analyses of amino acids in samples will be conducted using a BioChrom 30+ amino acid analyzer (AOAC 994.12). Analyses of minerals including yttrium will be subcontracted to the Department of Agricultural Chemistry, Louisiana State University Agricultural Center, Baton Rouge, LA, using inductively coupled plasma (ICP; AOAC 985.01). All analyses will be done in duplicate.

Analytical Labs	**Analyses**
University of Idaho Aquaculture Research Institute Nutritional Service Center 3059F National Fish Hatchery Road Hagerman, Idaho 83301	Proximate composition, Energy, Amino Acids
Agricultural Chemistry Laboratory Department of Agricultural Chemistry Louisiana State University Agricultural Center Baton Rouge, LA 70803	Minerals, including yttrium
Fish Biologist-Histology Dept. Bozeman Fish Health Center USFWS- Dept. of Interior 1805 South 22nd Avenue, Suite #1 Bozeman, MT 59718-7069	Histology

Calculations:
ADC of diets and ingredients, for dry matter, protein, lipid, amino acids and energy will be calculated using the following formula:

- ADC diet = 1 − [(F/D) × (Di/Fi)]
  - where D = % nutrient of diet, F = % nutrient of feces,
  - Di = % digestion indicator of diet, Fi = % digestion indicator of feces
  - ADC ingredient = ADCT + [((1 − s) DR)/s DI] × (ADCT − ADCR)
  - where ADCT = ADC of test diet, ADCR = ADC of reference diet, DR = % nutrient of reference diet,
  - DI = % nutrient of test ingredient, s = proportion of test ingredient in test diet (0.3)

Growth trial:
The trout growth trial will consist of the 5 dietary treatment groups (0, 25, 50, 75, 100% fishmeal replacement with DMW), each fed in quadruplicate to tanks of juvenile rainbow trout for 12 weeks. The diets (Table 3) will meet be isonitrogenous (47% crude protein), isoenergetic (5000 kcal/kg), and meet or exceed the nutrient requirements for rainbow trout (NRC, 2011). Final formulation will be based on the actual nutrient profile of the DMW ingredient. Experimental feeds will be produced by ooking extrusion at the Bozeman Fish Technology Center, Bozeman, MT. Feed samples will be analyzed for proximate composition and energy using the standard protocols described above. The personnel responsible for the day-to-day care and management of

the animals and for making and recording observations will be blinded to the experimental treatments. The final study report will include information regarding the extent of blinding (for example, monitor, investigator, caretakers), blinding methods and procedures, and a list of personnel with access to treatment codes and the rationale for the access.

Rainbow trout fry hatched from eggs purchased from a commercial source and reared to approximately 10 ± 2 g will be used. Forty fish will be stocked into each of twenty 145-L tanks supplied with 8 L min-1 of constant temperature (15°C), gravity-fed spring water and acclimated for 1 week on a standard commercial trout feed (Classic Trout, Skretting USA, Tooele, UT). Each diet will be fed by hand to four replicate tanks of fish to apparent satiation. Apparent satiation will be achieved by offering small quantities of feed to the fish by hand until feeding activity stopped. A completely randomized design will be used to assign diets to account for any tank position effects. The fish will be fed three times per day, six days per week. Photoperiod will be held constant at 14 h light: 10 h dark with electric timers. Tanks will be cleaned daily; any mortality will be recorded, and dead fish removed. Feed intake will be recorded. Fish will be weighed and counted every 3 weeks for the duration of the study (12 weeks). At the end of the study (day 84), length and weight will be measured for all fish, and 4 fish per tank fish will be sacrificed for analysis of whole-body and fillet proximate composition, calculation of hepatosomatic index (HIS = 100 x liver weight/body weight), and collection of blood for blood chemistry using a VetScan i-STAT□□1 handheld analyzer (Abaxis products, Union City, CA) for hematocrit, hemoglobin, ionized chloride, glucose, sodium, potassium, pH, pCO2, HCO3, TCO2, base excess, PO2, and sO2. Another 4 fish per tank will be necropsied, and distal intestine, liver, and trunk kidney will be sampled for histological analysis. Growth and feed utilization will be evaluated using conventional calculated indices (Hardy and Barrows, 2002), such as specific growth rate, thermal growth unit coefficient, feed conversion ratio, protein retention efficiency, and proximate composition.

Medication and/or vaccination during acclimation period:
Fish will not be medicated or vaccinated during the acclimation period.

Provisions for removal from study and necropsy:
Abnormal behavior, i.e., erratic swimming, loss of equilibrium or death, will be cause for removal from the study. Fish removed from the study or die during the treatment period will be necropsied an effort to determine cause of death. Dead fish weight, date of mortality, and necropsy observations will be recorded and reported.

Histological analysis: The Bozeman Fish Health Center (Bozeman, MT) will be subcontracted to fix distal intestine, liver, and trunk kidney samples following standard histological techniques used by the US Fish and Wildlife Service (Mumford, 2004) and histopathological evaluation following staining with hematoxylin and eosin.

Statistical analyses: Tank means will be used as units of observation for statistical analysis. Fish growth performance and body composition and nutrient digestibility will be tested for normality and homogeneity of variance prior to one-way ANOVA. If required, data will be transformed to achieve normal distribution. If significant differences are found, data will be subjected to Tukey's HSD test to separate the means at a significance level of $P<0.05$. Nonparametric procedures may be used rather than ANOVA if the data are not distributed normally with homogenous variance across control and test groups.

Final Report: Within (90) days after completion of the animal and laboratory work, the PI will submit to Beta Hatch a final written report containing all and any findings, analysis and conclusions, including the raw data as well as statistical software lists and logs for the statistical analyses conducted.

Table 1. Proximate composition of defatted mealworm (DMW) meal (MidWest Laboratories, Omaha, Nebraska), based on preliminary analysis prior to final ingredient processing.

Ingredient	Inclusion level
Moisture	4.2
Crude Protein	72.4
Crude Fat	5.3
Fiber (acid detergent)	11.4
Ash	6.6

Table 2. Ingredient composition of reference mash (%, as-fed basis)

Ingredient	Inclusion level
Fishmeal, sardine[a]	33.0
Soy protein concentrate[b]	13.9
Corn protein concentrate[c]	10.0
Wheat flour[a]	18.0
Wheat gluten meal[a]	7.10
Dicalcium phosphate[a]	1.20
Choline chloride (60%)[a]	0.60
Vitamin C (Stay C, 35%)[a]	0.20
Vitamin premix, ARS 702[d]	0.80
Trace mineral mix, Trouw Nutrition[e]	0.10
Fish oil, Alaska pollock[f]	15.0
Yttrium oxide[g]	0.10
Total	100

[a] Rangen Inc., Buhl, ID, USA
[b] Profine VF, The Solae Company, St. Louis, MO, USA
[c] Empyreal® 75, Cargill Corn Milling, Cargill, Inc., Blair, NE, USA.
[d] US Fish and Wildlife Service Trace Mineral Premix #3. It supplied the following (mg/kg diet): Zn (as ZnSO4.7H2O), 75; Mn (as MnSO4), 20; Cu (as CuSO4.5H2O), 1.54; I (as KIO3), 10
[e] Vitamin premix supplied the following per kg diet: vitamin A, 2.4 mg; vitamin D, 0.15 mg; vitamin E, 267 mg; vitamin K as menadione sodium bisulfite, 20 µg; thiamin as thiamin mononitrate, 32 mg; riboflavin, 64 mg; pyridoxine as pyridoxine-HCl, 64 mg; pantothenic acid as Ca-d-pantothenate, 192 mg; niacin as nicotinic acid, 240 mg; biotin, 0.56 mg; folic acid, 12 mg; vitamin B12, 50 µg; and inositol as meso-inositol, 400 mg.
[f] Skretting USA, Tooele, UT, USA.
[g] Sigma Aldrich, St. Louis MQ, USA.

Table 3. Approximate ingredient and nutrient composition of the experimental diets replacing fishmeal with mealworm protein meal (DMW) fed to rainbow trout juveniles over a 12-week growth trial (%, as-fed basis). Actual composition will be adjusted following analysis on ingredient nutrient content.

Ingredients	**Diet 1** FM 40 / DMW 0	**Diet 2** FM 30 / DMW 10	**Diet 3** FM 20 / DMW 20	**Diet 4** FM 10 / DMW 30	**Diet 5** FM 0 / DMW 40
Fish meal, sardine[a]	40	30	20	10	0
Mealworm protein (DMW)	0	10	20	30	40
Soybean meal[a]	9.5	11.5	10	8	6
Wheat gluten meal[a]	7	7	7	7	7
Corn protein conc.[c]	10	8	7	6	5
L-lysine HCl[g]	0	0	0.53	1.00	1.65
DL-methionine[g]	0	0	0	0.12	0.23
Wheat flour[a]	16.5	15.4	16.5	17.9	19.2
Dicalcium phosphate[a]	0	1.42	2.52	3.62	4.72
Trace mineral mix, Trouw[d]	0.1	0.1	0.1	0.1	0.1

Vitamin Premix, ARS 702 [e]	1	1	1	1	1
Choline chloride (60%)[a]	0.6	0.6	0.6	0.6	0.6
Stay C (35%) vitami [a]	0.2	0.2	0.2	0.2	0.2
Fish oil[f]	15.1	14.8	14.6	14.5	14.3
Nutrients (% as-fed basis)					
Dry Matter	94.0	94.1	94.4	94.7	95.0
Protein	47.5	47.6	47.6	47.5	47.6
Fat	20.0	19.8	19.8	19.8	19.8
Ash	7.89	7.71	7.13	6.53	5.93
Gross energy (kcal/kg)	5020	5002	5017	5034	5053

[a] Rangen Inc., Buhl, ID, USA
[b] Profine VF, The Solae Company, St. Louis, MO, USA
[c] Empyreal® 75, Cargill Corn Milling, Cargill, Inc., Blair, NE, USA.
[d] US Fish and Wildlife Service Trace Mineral Premix #3. It supplied the following (mg/kg diet): Zn (as ZnSO4.7H2O), 75; Mn (as MnSO4), 20; Cu (as CuSO4.5H2O), 1.54; I (as KIO3), 10
[e] Vitamin premix supplied the following per kg diet: vitamin A, 2.4 mg; vitamin D, 0.15 mg; vitamin E, 267 mg; vitamin K as menadione sodium bisulfite, 20 µg; thiamin as thiamin mononitrate, 32 mg; riboflavin, 64 mg; pyridoxine as pyridoxine-HCl, 64 mg; pantothenic acid as Ca-d-pantothenate, 192 mg; niacin as nicotinic acid, 240 mg; biotin, 0.56 mg; folic acid, 12 mg; vitamin B12, 50 µg; and inositol as meso-inositol, 400 mg.
[f] Skretting USA, Tooele, UT, USA.
[g] Sigma Aldrich, St. Louis MQ, USA.

References:

AOAC (Association of Official Analytical Chemists). 1990. Official Methods of Analysis, 15th ed.Association of Official Analytical Chemists, Arlington, VA, pp. 1298.

Hardy, R.W. and Barrows, F.T. 2002. Diet Formulation and Manufacturing, in: Halver, J.E. and Hardy, R.W. (Eds.), Fish Nutrition, 3rd ed. Academic Press, San Diego, CA, USA, pp. 505–600.

Mumford, S.L. 2004. Histology of finfish. NWFHS Laboratory Procedures Manual, 2nd ed, June 2004. USFWS, Olympia Fish Health Center. Olympia. Washington.

NRC (National Research Council). 2011. Nutrient requirements of fish and shrimp. National Academy Press, Washington D.C., pp. 376.

BUDGET

Salaries	FTE	Hourly Rate	#Pay Periods	Hrs/Pay	Totals	**$11,100**
Principal Investigator--Brian Small	0.02	$79.33	13	80	$1,650.06	
Post-doc	0.15	$24.04	13	80	$3,750	
Research Specialist--Carol Hoffman	0.05	$24.62	13	80	$1,280	
Hatchery Workers	0.20	$14.34	9	80	$2,065	
Asst Operations Manager	0.20	$16.35	9	80	$2,354	

Fringe Benefits			**$4,341**
Principal Investigator	0.294	$485.12	
Research Scientist/Post-doctoral fellow	0.408	$1,530.10	
Research Specialist	0.408	$522.34	
Hourly hatchery workers	0.408	$842.50	
Asst Operations Manager	0.408	$960.60	

Nonexpendable equipment		**$0**
	$0	
Materials and Supplies		**$25,465**
Fish culture supplies	$2,300	
Feeds	$6,000	
Nutritional analyses for digestibility trial	$2,255	
Nutritional analyses for growth trial	$4,230	
Blood chemistry	$1,600	
Histopathology	$8,880	
Yytrium analysis ($20 x 10)	$200	
Travel		**$1,200**
Domestic: Travel for project (Idaho-Washington)	$1,200	
Other direct costs		**$0**
	$0	
Total Direct Costs:		**$42,106**
FACILITIES & ADMINISTRATIVE RATES: 39% of MTDC		**$16,421**
TOTAL PROJECT COSTS:		**$58,527**

Attachment B – CONTACT INFORMATION

University	Sponsor
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****If a Sponsor contact is not provided, any information that would have been sent to that individual will be sent to the Technical Contact.*