

Original: Fish Division ✓  
cc: Education-Game  
Inst. for Fish. Res. ✓  
E. F. Grassl  
M. J. DeBoer  
L. N. Allison

INSTITUTE FOR FISHERIES RESEARCH  
DIVISION OF FISHERIES  
MICHIGAN DEPARTMENT OF CONSERVATION  
COOPERATING WITH THE  
UNIVERSITY OF MICHIGAN

Gerald P. Cooper  
~~XXXXXXXXXXXX~~ PH.D.  
DIRECTOR

ADDRESS  
UNIVERSITY MUSEUMS ANNEX  
ANN ARBOR, MICHIGAN

November 27, 1956

Report No. 1491

TROUT NUTRITION STUDIES IN EFFECT AS OF NOVEMBER 1, 1956

By

E. F. Grassl ✓

The following experiments have been and are in effect at Wolf Lake State Fish Hatchery. For convenience Tank No.'s at Wolf Lake will be associated with each project and experiment.

TANK 2

Rainbow Trout

Brief History:

Young-of-the-year rainbow trout which hatched early in 1953 were selected for this experiment. From hatching to August 19, 1953 they received raw-beef liver only. From August 19, 1953 to August 18, 1954 they received an experimental pelleted diet the results of which have been reported in my thesis. The pelleted diet was formulated to contain gelatin and is the only diet recorded in my thesis containing gelatin ✓.

---

✓ Dr. Grassl resigned from his Fish Nutritionist position with the State of Michigan on Nov. 1, 1956. At that time he had several feeding experiments going at the Wolf Lake Hatchery. Dr. Grassl's notes on these experiments, prepared for the benefit of whoever might follow up on the experiments, are given in their original form in this report.--G. P. C.

✓ I do not have my thesis with me therefore the exact composition will not be included in this report. The results were insignificant and for general purposes the diet, as a production diet, can be ignored.

This diet was discontinued August 18, 1954 and our 2-B Diet started. The feeding schedule followed during period August 18, 1954 to March 12, 1956 was similar to that usually followed in production feeding, that is, pellets 4 days and raw beef liver one day per week. From March 12, 1956 to date these fish received a pelleted diet 2-A containing aureomycin in amounts of activity of 110 grams per ton of finished feed.

The reason for continuing this experiment lies in the fact that spawn taken and hatched from these adult fish receiving an antibiotic diet could be used for studies of the effect of aureomycin on parent fish and their progeny. Also, if and when genetic studies are undertaken by someone at the University, that is, basic research concerned with genes and chromosomes, these fish, and those in Tanks 5 and 10 as well, should serve as excellent subjects. For example: It may be desirable to know what effect age of parent fish might have on the genes when passed on to their progeny. Since genes constitute the main ingredient of heredity and although they always follow a definite pattern, they are, nevertheless, also subject to the ageing process. Even though we already are aware that older animals are less likely to produce desirable progeny than younger animals, perhaps someone would want to prove it and report the results. Therefore animals with a known case history are the most desirable.

(Note: Ingredients of the pelleted diet containing gelatin, from Grassl's thesis, were as follows:)

<u>Diet No. 6</u>	<u>Lbs.</u>
Red fish meal	36
Wheat flour middlings	22
Torula yeast	3

Brewers yeast	3
Condensed fish solubles	3
Skim milk	5
Iodized salt	2
Soybean oil meal	25
Gelatin	<u>2</u>
	101 <sup>*</sup> ✓

TANK 10

Rainbow Trout

From the start of the experiment to August 18, 1954 these trout had the same history as those in Tank 2 and were in fact part of that group until moved to Tank 10. From August 18, 1954 to date the trout in Tank 10 received a diet consisting of raw beef liver only. Some of the reasons for holding these fish are: 1) to determine the physiological differences between various groups fed various pelleted diets and 2) to compare the reproductivity of each group fed various diets.

TANK 4

Rainbow Trout

One trough of rainbow trout hatched in 1954 were reserved for an experiment in which only non-raw-meat diets were used. At the time these trout were advanced enough to take food (at "swim up" time) a special

---

✓ 1 lb. lost in processing.

amino-fry diet was prepared and fed. This diet was fed from hatching time in 1954 to August 25, 1954 at which time the fish were moved from the trough to Tank 4 and introduced to our 2-B diet in 1/8" size. Diet 2-B has been fed up to date and is currently in use, being dispensed by an automatic pellet feeder. Raw-meat was never fed at any time. The composition of the amino-fry diet is too complex for practical use. However, the results from feeding this diet should furnish enough information so that the 2-B diet can be modified for fry feeding.

These trout should be kept on the diet now used for an indefinite time if for no other reason than to prove that it can be done. As far as I know these are the only rainbow trout of this age in existence in the United States which have been reared on a completely non-raw meat diet. (See also Tank 6)

#### TANK 6

#### Rainbow Trout

The history of these trout is the same as described for trout in Tank 4, one-half of which were moved from Tank 4 to Tank 6. On April 1, 1956 the diet was changed from 2-B to Ft (High fiber diet) to determine what effect a lower energy ration might have on growth, color, etc. The composition of diet Ft is as follows:

	<u>Parts</u>
Skim milk	5
Fish meal	33
Cottonseed meal	23
Wheat flour midds	25

Torula yeast	5
Reground oat feed	5
Iodized salt	2
Grain fermentation solubles	1.5
Condensed fish solubles	1.5

Again, as for the trout in Tank 4, no meat was fed to this group at any time.

#### TANK 5

##### Rainbow Trout

Young-of-the-year (1953) trout were started on 2-A pellets August 5, 1953 and have received this diet to date. They are being held mainly to:

- 1) demonstrate the value of 2-A diet when fed for an extended period, and
- 2) function as parent fish for progeny studies as described for fish in Tank 2.

#### TANK 7

##### Brook Trout

The history and results of feeding various diets is explained in detail in a paper prepared for publication in the Progressive Fish-Culturist. These fish were fed the same amino-fry diet as the rainbows in Tanks 4 and 6 before changing to the regular 2-B Diet and antibiotic diet. These fish have never received raw meats in their diet.

TANK 8

Brook Trout

Same as Tank 7, except the 2-B diet did not contain antibiotics.

TANK 9

Rainbow Trout

Serves as the raw beef liver control for all other diets. Started with young-of-the-year trout on September 15, 1954 and is still in effect.

TANK 11

Rainbow Trout (Wild)

Hatched from wild trout eggs.

Receiving 2-A Diet.

Held for genetic purposes. Selective breeding purposes.

TANK 12

Lake Trout

Lake trout transported to Wolf Lake from Harrietta Hatchery. Various diets used during last 6 months. Current diet fed is 2-B. Doing very well. Gained from 31.5 to 55.5 lbs. (24 Lbs.) in 4 months. Feeding almost as well as rainbow and brook trout. There will be more to do on this group before definite conclusions are drawn.

This is the 2-B diet now in use.

	<u>Parts</u>
Red fish meal	36
Cottonseed meal	23
Wheat flour midds	25
Torula yeast	3
Brewers yeast	4
Iodized salt	2
Grain fermentation solubles	1.5
Condensed fish solubles	1.5
Skim milk	<u>5</u>
	101

The modified 2-B Diet above was first used May 17, 1956. I can't see any difference between this diet and the original 2-B when growth and color are considered. But, when reproduction is considered, brewers yeast furnishes two factors that torula lacks. One is a factor which aids in the prevention of necrotic liver degeneration and the others vitamin E and a new vitamin, recently discovered to be present in brewers and not torula yeast, factor 3. Factor 3 and vitamin E are very important in producing healthy and normal offspring. For this reason it will be interesting to compare this year's fry production with last year's. Especially those eggs taken from fish at Wolf Lake from my fish.

INSTITUTE FOR FISHERIES RESEARCH

E. F. Grassl

Approved by: G. P. Cooper

Typed by: J. M. Lederer