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THE FEEDING HABITS OF THE MONTANA GRAYLING (Thymallus montanus)*

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An investigation basic to a management program for the grayling in Montana was begun in the autumn of 1935 and extended intermittently through the next two years. Certain aspects of this study were carried out with the aid of a grant from the National Research Council. Due to a change in residence, it was not possible to complete the proposed program, but some of the data seem to have sufficient merit for publication. The food habits study is the first to be presented. Acknowledgments are due Mr. Elmer G. Phillips, former superintendent of fisheries in Montana, and the late Mr. Harry L. Johnston, superintendent of the Bozeman Station, for their fine cooperation in this study. I am indebted to Professor M. H. Spaulding, who shared in the collection of material, and to the U. S. Bureau of Fisheries for furnishing most of the equipment and the hatchery facilities.

Artificial Feeding

The difficulties involved in the artificial propagation of grayling have in practically all instances been those of feeding. Certain fish culturists have contended that grayling fry differed from the other cold-water game fish in that they required living food, such as the plankton

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* Contribution from the Institute for Fisheries Research, Michigan Department of Conservation and University of Michigan.

of stream or lakes. According to this notion, the ordinary meats and meals used in the culture of trout were entirely unsatisfactory. Laird (1928) and Lord (1932), as well as several other fish culturists, have demonstrated that the problem is concerned more with the size of the food particles and the frequency of feeding than with the kind of food itself. Certain recommendations call for the use of beef liver or heart to be ground as many as 10-20 times through a plate with 1/64-inch openings. The feeding process consists of forcing the finely ground meat through a fine mesh screen into the water of the holding troughs. The interval of feeding recommended varies from 1-3 hours throughout the working day. By this method it has been possible to carry grayling past the difficult fry stage with no more than the expected loss. The fingerling and adult grayling are as easily cultured as trout by using the more or less standard hatchery methods and diets.

Experimental Feeding with Natural and Artificial Food

Henshall (1899, 1907) was only able to rear grayling past the fry stage when he supplied them with creek water containing natural food. He described this as consisting of Daphnia, Cyclops, shrimp and snails. It is hardly probable that these organisms were the important foods in his experiment, since the creek (Bridger) water used contains little or no plankton Entomostraca and since it would be utterly impossible for fry to feed upon any of the ordinary shrimp or snails because of their size. Elmer G. Phillips had less than a five per cent mortality in grayling during the first $2\frac{1}{2}$ months, fed on a diet of total net plankton from Albert Lake, near Libby, Montana. An examination of the plankton from this lake showed it to contain Daphnia and Diaptomus almost exclusively.

An experiment was undertaken to determine whether or not grayling fry would exercise selection when offered the total plankton of lakes. About 5000 fry held at the Meadow Creek station (water temperature 45-48° F.) were

presented total net plankton from Meadow Lake at three hour intervals, starting the third day after the peak of hatching. Each day following, at 20-30 minutes after the first feeding, 25 fish were subjected to microscopical stomach examinations. The first discovery of stomach contents occurred in nine day old individuals and only a small number began taking food before the thirteenth day. The peculiar thing about this was the early attempt at feeding made by most of the fry. After the fifth day there was marked activity each time plankton was introduced. These tiny fish would try time after time to take adult Entomostraca but without success, as shown by subsequent examinations of their digestive tracts. Apparently the small size of the mouth prevents the taking of food organisms during this stage. This is in contrast to trout fry which were able to eat even the largest plankters on their first day of feeding. Between the time food was actually taken and the fourth to fifth week, the food eaten was confined to the nauplii of Cladocera and Copepoda with an occasional filament of Algae. After the fifth week practically all of the fry stomachs examined contained both nauplii and adults of Entomostraca as well as a very small number of rotifers, protozoans and algae. The absence of these latter was so conspicuous in proportion to their relative abundance that it is safe to conclude a degree of preference was shown for the Entomostraca. In all of the fish (1-5 weeks old) examined, which amounted to several hundred, the maximum number of organisms taken by a single fish during the 30 minute interval following the introduction of food, was 22 and the average eight.

In a later experiment conducted at the Bozeman station (water temperature 49-52°F.) in which artificial food was introduced, the first evidence of feeding occurred in five day old fish. By the seventh day more than 90% of the fry in these troughs had stomach contents. It is obvious that both the temperature of the water and the size of the food particles determine the time when fry will begin feeding.

A few grayling fry placed in a pond at the Bozeman station were observed to live almost entirely on midge larvae. Of 12 fish examined, all had midge larvae in their stomachs. The only other food items taken consisted of a few blue-green algae, one Cyclops and 11 immature Copepoda. Forty-seven tiny midge larvae were found in one 20 mm. fish.

There is some evidence that grayling fry are mainly day feeders. Those placed in dark troughs remained comparatively inactive even when concentrated plankton was introduced. The addition of electric lights immediately above the troughs, greatly increased the feeding activity.

Natural Feeding

The fact that grayling are so easily caught at times is indicative of their voraciousness. Parker (1888) observed the Michigan species during its natural feeding activity and records 50 rises in 15 minutes for one fish. They feed both deep and at the surface and seem to be as versatile in their tastes as there are available food species - with the exception of fish. In all of the specimens taken for study, not a single one was without food in its stomach. Grayling are almost invariably found in schools and it is not at all unusual to see three or four individuals rise for the same fly. In one instance, a specimen was taken a second time on an artificial fly within three hours after being jaw-tagged. These fish, in coming to the surface for food, often swim with enough force to almost completely leave the water. Montana grayling fry exhibit many of the qualities of the adult. They feed vigorously and almost without caution.

Stomach Examinations of Wild Fish

The stomachs of approximately 125 fish were examined. The larger specimens were collected by fly casting, with the exception of about

10 individuals taken from the state and federal traps during the spawning season. The fry and fingerlings were captured with small mesh nets. Collections were made in the artificially stocked waters of Rogers Lake, Flathead Co., Agnes Lake, Beaverhead Co., Montana and from Grebe Lake in Yellowstone National Park. A fair number was also secured from the mouth of Meadow Creek, Madison Co., Montana, one of the grayling's original habitats. All fish were measured and weighed at the time of capture; their stomachs were removed and preserved in seven per cent formalin for later study. Examinations of stomach contents were made in the laboratory with the aid of a dissecting microscope. The organisms found were counted and identified to the larger taxonomic groups, then spread on blotting paper for 1-2 minutes to remove excess moisture and finally weighed on a torsion balance to the nearest .05 gram. The cc. volume by water displacement was also taken but was found to be practically identical with the weight in grams and so is not given in the following tables. The results are arranged according to localities and sizes of fish. In most cases, the size groups represent age classes. All weight percentages are given in terms of total weight, minus the debris. This last named class of substance contained such items as sticks, stones, caddis cases and mud, which obviously had no food value.

Very little published information has come to the writer's attention concerning the food of the Montana grayling. A note on stomach examinations of Michigan grayling is given by Milner (1874) in which he lists Coleoptera, Neuroptera and the larvae of dragonflies as food items. He also found the leaves of the white cedar which he credits to accidental food. Norris (1883) speaking of the Michigan grayling says, "The various orders of flies which lay their eggs in running water, and the larvae of such flies, appear to be their only food." This is especially interesting because in the present study midges have been found to be the most commonly occurring items in the stomachs of all sizes of Montana grayling. Parker (1888) considered

the Michigan grayling as a vegetable feeder and accounts for the flavor of the fish by this assumption.

Meadow Creek (Table I)

The mouth of Meadow Creek constitutes about 150 yards of stream, most of which is directly influenced by the fluctuation of Meadow Lake reservoir. During the periods of high lake level this portion of the stream becomes sluggish, but remains considerably colder than the lake. Grayling congregated here during the early summer and were the predominant species along with fewer brown, rainbow and brook trout. This is one of the few original waters which is still occupied by grayling and the data secured from stomach examinations of these fish should represent, at least in part, original feeding conditions.

(Insert Table I)

Stomach examinations indicate that large quantities of non-nutritive materials are regularly ingested by this species. The item of debris, in the group of smaller fish from Meadow Creek, made up 70.1% of the total weight of stomach contents and in the larger fish this constituted 58.8%. The aquatic insects accounted for 66.5% by weight of the food organisms present in the smaller fish and 55% in the larger. Mayflies were predominant, or 23.7% of the total food in the first group, while damselfly nymphs made up 33.2% in the second. The aquatic coleoptera equalled 7.4% of the diet in the larger fish. All of these beetles were adults and more than one-half were Donacia with Dytiscidae, Hydrophilidae, Haliplidae and Parnidae in the order of their abundance.

Terrestrial insects contributed more to the larger fish, equalling 31.8% of the total weight as compared to 12.3% for the smaller. A few

large grasshoppers were mainly responsible for this difference, making up 29.6% of the total food for the 250-335 mm. specimens. Other aquatics were confined almost entirely to the Crustacea, with Cladocera accounting for 19.6% of the total weight in the first size group and the isopod, Asellus, amounting to 4% in the second. Five brown trout fingerlings were found in the stomach of one large female grayling. This was unusual but not surprising, since this fish was caught within 200 feet of the hatchery outlet, where trout fingerlings were concentrated in great abundance. This was the only instance observed where fish of any kind were used as food. According to Svetvidov (1931), the white grayling from Lake Baikal in Russia, feeds chiefly on fish and amphipods. Heckel and Kner (1858) and Siebold (1863) list fish brood and minnows as regular items of food for the European grayling. There are no records, except the one above, which show fish in the stomachs of the Montana or Michigan species.

Rogers Lake (Table II)

Rogers Lake has proven to be an excellent grayling water. It is free from other species of fish except the cutthroat trout which occurs in very limited numbers. The lake has a maximum depth of about 25 feet and supports an enormous amount of vegetation. The maximum summer temperature is near the upper limit of toleration for trout and grayling (about 80°F.). The fish in this lake were in excellent condition and showed rapid growth. Food organisms were abundant, especially the midges.

There was practically no debris in the stomachs of the 20 fingerlings seined from this lake. The 150-250 mm. specimens contained 25% debris, while the largest specimens had 72.6%. Aquatic organisms made up almost 100% of the total stomach food contents in the 150-250 mm. fish and 74.7% in the 250-338 mm. specimens. Midges and water fleas were the most important aquatic items of the fingerlings' diet. In the 150-250 mm. specimens,

midges made up 71.3% of the total weight, with amphipods contributing 14.3%. The stomachs of the larger fish contained 27.7% amphipods, 18.8% midges and 14.1% Cladocera. The fish eggs taken included both those of grayling and cutthroat trout. All of the fish having eggs in their stomachs came from the Montana state fish traps during the spawning season.

(Insert Table II)

The largest variety of terrestrial insects was found in the fingerlings' stomachs, but the only significant terrestrial item as far as quantity is concerned was the 6.1% of Coleoptera found in the larger size fish. Small quantities of filamentous algae were rather common. Other items not given in table II were as follows: 10 leech egg cocoons, one terrestrial arachnid, one Gordius and eight nematodes. These latter were probably parasitic.

Grebe Lake (Table III)

Grebe Lake is situated at an elevation of about 8000 feet and is one of the more productive mountain lakes, with comparatively shallow water and abundant vegetation. A few rainbow, cutthroat and rainbow cutthroat (hybrids) were present along with an abundant population of grayling. The fish examined from here were in good condition. Food organisms were plentiful, especially the damselflies, Argia and Ischnura.

Twenty-five grayling fry (19-24 mm. standard length) taken from the east end of Grebe Lake had 53 midge larvae and pupae as well as 21 very small mayfly nymphs in their stomachs. Plankton samples from the same part of the lake showed Daphnia, Diaptomus, rotifers and many algae to be present, but none of these had been used as food.

Debris made up 38.3% of the total weight of stomach contents in the larger fish (table II). The food organisms consisted of 76.9% aquatic insects and about two per cent terrestrial insects. All of the latter

were Coleoptera. About 40% of the aquatic species were midges and 20% damselflies. The aquatic Coleoptera, Donacia and Hydrophilidae, equalled 9.3%, amphipods, 10.2% and Asellus one percent of the total weight of all food taken. Algae were fairly numerous in many stomachs and accounted for 10.2%. Two 265 mm. fish not listed in table III, taken from the traps at Grebe Lake during the spawning season, contained 137 grayling eggs besides one damselfly nymph and two adult Dolichopodidae.

(Insert Table III)

Agnes Lake (Table III)

Agnes Lake is a small mountain lake with barren rocky shoals, situated at an altitude of about 9000 feet. No fish were present in this lake until about 1930, when grayling were stocked by the Montana State Fish and Game Commission. During the next five years heavy plants were made with no open fishing season. In the spring of 1935, when the writer visited here, the fish were in very poor condition and obviously hungry. Very few food organisms of any kind were observed and conditions pointed to an almost complete lack of vegetation.

The stomachs of six grayling from this lake contained 52.5% debris. The aquatic insects were represented by only two groups: midges which accounted for 39.4% and mayflies which made up 10.5% of the total weight of food organisms taken. Terrestrial insects (all Coleoptera) constituted 13.1% of the total, while amphipods were present to the extent of 5.3%. The item of grayling eggs (31.6%) seems large, but is entirely the result of conditions at the time of capture. With the very limited area for spawning, there is great wastage of eggs in this lake. Many of these are eaten by the spawners themselves.

Comparison Between the Feeding Habits of Grayling and Trout

There is great similarity between the feeding habits of grayling and cutthroat trout. Specimens of both these species taken from Grebe Lake on the same date had the same kinds of organisms in their stomachs. The percentages of the food items in the two species were somewhat different, however, but not more so than the variation found between any two grayling or any two trout. Damselflies made up 60% of the stomach contents of the cutthroat trout and about 20% of the grayling, while midges amounted to 6% of the cutthroat's diet and 40% of the grayling's. Hazzard and Madsen (1933) list the aquatic food of 40 cutthroat trout from Glacier National Park lakes as 92.4% and the terrestrial as 7.6%. In Rogers Lake, which is near and similar to the above lakes, 21 of the larger grayling contained 93.9% aquatic organisms and 6.1% terrestrial. Mayflies and shrimp were the most important items in the cutthroat trout diet, while shrimp and midges were the major items in that of grayling. The ratio of aquatic to terrestrial foods for 40 Meadow Creek grayling was about 78%:22% and for the 36 cutthroat trout from Teton Park streams (Hazzard and Madsen, 1933) this ratio was 75%:25%. Most of the important food items, exclusive of fish and other vertebrates, recorded as important for cutthroat trout are also important in the grayling diet.

A comparison was made between the feeding habits of grayling and the trout (rainbow, brown, brook) in Meadow Creek. Stomachs of all these species taken on the same day showed a complete duplication of items. The proportions of the various organisms varied between species and individuals within the species but not in such a way as to indicate a difference of selection. Coston, Pentelow and Butcher (1936) point out that the European grayling has exactly the same food requirements as trout. They list insect larvae, shrimp, snails, ephemerids, caddis and smuts as characteristic

food items. None of the specimens studied had fish in their stomachs, although several hundred trout and sucker fingerlings were seined from some of the same pools in which certain of the larger fish were caught. Most of the organisms found in the trout stomachs were aquatic. Daphnia was the largest single item in the two brook trout, damselflies in the three rainbow trout and the isopod, Asellus, in the five brown trout. Three of the brown trout also contained snails (Physa), an item which was not found in any of the other fish.

Two doubles (table IV) each consisting of a grayling and a brown trout were taken on two "Cahill" flies and their stomachs saved for separate study. The organisms found in the stomachs of these four fish are almost equivalent to a random sample of the most available food species taken from Meadow Creek on the same date. While Cladocera were not present in the brown trout, they were found in other specimens of this species taken about the same time. The other differences in the stomach contents are certainly not significant when individual variation is considered.

(Insert Table IV)

It is quite evident from the records of Metzelaar (1929) and others that trout and grayling are not very selective in their feeding habits. The kinds and abundance of different organisms in the diets of these fish are determined by the size of the fish taking the food and the availability of the food species. The availability of food species is determined by the habitat and the season of the year. Because a certain organism is found to consistently make up a part of a fish's food does not necessarily mean that the fish selected it in preference to something else. In order to test selection, we must have all items present in equal numbers.

Bottom and plankton samples taken on the grayling waters mentioned above indicate that the invertebrate food items of grayling are roughly proportional to their relative abundance. The season of the year and the habitat of the fish almost certainly have greater influence on what is eaten than any selection these fish have demonstrated by their stomach contents.

There can be little doubt but what trout and grayling are natural competitors. The introduction of non-endemic trout into grayling waters certainly has contributed to the decrease of the grayling. A list of our present successful grayling waters includes only those which are free or nearly free of such trout. On the other hand, the grayling and cutthroat trout, which originally occupied certain Montana waters, are compatable even today in the successfully stocked Georgetown, Rogers and Grebe lakes. Under present conditions in many places where rainbow, brown and brook trout have been introduced, the cutthroat as well as the grayling has almost completely disappeared.

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TABLE I

SUMMARY OF FOOD ORGANISMS SECURED FROM THE STOMACHS OF MEADOW CREEK GRAYLING

Kind of Organism		Dates: June 14, 27 and July 10, 1936. Size of fish: 190-250 mm. standard length. Number of fish: 20. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish*	% of Total Wt. of All Food Taken*	Dates: June 14, 27 and July 10, 12, 1936. Size of fish: 250-335 mm. standard length. Number of fish: 20. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish*	% of Total Wt. of All Food Taken*
Aquatic Insects:													
Mayflies	Nymph	62	6.2	40	2.4	94	21.9	42	6.0	40	1.7	64	6.1
(Ephemeroptera)	Adult	6	0.6	25	0.2	20	1.8	19	1.0	15	0.15	21	0.5
Damselflies	Nymph	8	1.6	40	1.5	81	13.7	20	2.8	45	3.0	44	10.8
(Odonata)	Adult	5	7.5	20	1.0	46	9.1	41	4.1	45	6.2	82	22.4
Stoneflies	Nymph	4	2.5	10	0.5	16	4.6						
(Plecoptera)	Adult												
Caddisflies	Larva	1	0.15	15	0.5	22	4.6	2	0.35	20	0.85	70	3.1
(Trichoptera)	Adult	3	0.2	10	0.15	35	1.4	1	0.05	5	0.1	3	0.4
Bugs	Larva												
(Hemiptera)	Adult	2	0.2	15	0.1	13	0.9	6	1.2	45	0.45	9	1.6
Beetles	Larva												
(Coleoptera)	Adult	1	1.5	15	...	...	...	29	5.2	65	2.05	52	7.4
Midges	Larva pupa	56	11.4	95	0.95	92	8.7	46	7.35	85	0.75	9	2.7
(Diptera)	Adult	2	0.15	10	...	...	...	1	0.1	10	...	...	...
Terrestrial Insects:													
Grasshoppers (Orthoptera)		2	0.1	5	0.4	29	3.7	8	1.6	50	8.2	70	29.6
Leafhoppers (Homoptera)								6	0.3	5	...	...	...
Beetles (Coleoptera)		1	0.05	5	...	...	...	1	0.05	5	...	...	...
Flies (Diptera)		10	1.8	35	0.75	62	6.8	2	0.04	25	0.25	11	0.9
Bees (Hymenoptera)		5	0.35	20	0.20	14	1.8	4	0.04	15	0.35	19	1.3
Other Aquatics:													
Waterfleas (Cladocera)		937	191	45	2.15	90	19.6	64	4.0	10	0.05	6	0.2
Shrimp (Amphipoda)								2	0.25	15	0.15	9	0.5
Sow Bugs (Isopoda)		4	0.2	10	0.15	66	1.4	19	2.4	25	1.0	29	4.0
Fish Salmo trutta								5	0.25	5	2.35	75	8.5

* Debris not included.

TABLE II

SUMMARY OF FOOD ORGANISMS SECURED FROM THE STOMACHS OF ROGERS LAKE GRAYLING

Kind of Organism		Date: July 19, 1936. Size of fish: 22-50 mm. standard length Number of specimens: 20. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Date: July 19, 1936. Size of fish: 150-250 mm. standard length. Number of specimens: 10. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish	% of Total Wt. of All Food Taken	Date: May 24, 1936 and July 19, 1936. Size of fish: 250-338 mm. standard length. Number of specimens: 21. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish	% of Total Wt. of All Food Taken
Aquatic Insects:																
Damselflies (Odonata)	Nymph	One small dragonfly nymph			10	0.7	10	0.25	69	2.1	3	0.25	15	...	...	...
	Adult										1	0.50	5	...	...	...
Caddisflies (Trichoptera)	Larva										4	0.25	10	0.4	10	3.8
	Adult	1	0.05	5	3	0.3	5	0.10	35	0.8	1	0.10	10	...	...	...
Bugs (Hemiptera)											1	0.10	9	0.15	52	1.4
Midges (Diptera)	Larva															
	pupa	57	12	90	1050	446	70	8.45	100	71.3	631	177.0	70	...	100	...
	Adult	33	4.9	60							600	35.0	9	2.00	86	18.8
Other flies (Diptera)	Larva				✓1454	146	10	1.15	98	9.7						
	Adult															
Terrestrial Insects:																
Thrips (Thysanoptera)		3	0.25	15												
Leafhoppers (Homoptera)		1	0.1	10												
Beetles (Coleoptera)		1	0.05	5							2	0.4	30	0.65	38	6.1
Flies (Diptera)		10	0.25	25	1	0.05	5	...	...	...	1	0.05	5	...	...	...
Bees (Hymenoptera)		3	0.30	15	1	0.10	10	...	...	...	1	0.30	15	...	...	...
Other Aquatics:																
Water fleas (Cladocera)		926	187	85	688	112	30	0.2	25	1.7	3150	176	20	1.5	67	14.1
Copepods (Copepoda)		47	6	15												
Shrimps (Amphipoda)		4	0.35	15	8	1.7	60	1.7	26	14.3	64	11.2	72.0	2.95	91	27.7
Snails (Gastropoda)											35	2.4	20.0	1.35	85	12.7
Water mites (Hydrachnida)		11	2.0	40												
Fish eggs											35	4	14.0	1.65	100	15.5
Algae												Several small bunches				

✓* Corethra.

TABLE III

SUMMARY OF FOOD ORGANISMS SECURED FROM THE STOMACHS OF GREBE AND AGNES LAKE GRAYLING

Kind of Organism		GREBE LAKE Date: July 6, 1936. Size of fish: 125-162 mm. standard length. Number of specimens: 14. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish	% of Total Wt. of All Food Taken	AGNES LAKE Date: June 6, 1936. Size of fish: 250-325 mm. standard length. Number of specimens: 6. Greatest No. in Any Fish	Average No. Per Fish	% of Fish With Organism	Total Wt. of Organism For All Fish	Greatest % of Total Wt. in Any Fish	% of Total Wt. of All Food Taken
Aquatic Insects:													
Mayflies	Nymph	2	0.6	40	...	...	...						
(Ephemeroptera)	Adult	7	1.1	30	0.2	33	3.7	6	1.0	17.0	0.2	25	10.5
Damselflies	Nymph	9	1.0	21	0.8	87	14.8						
(Zygoptera)	Adult	3	0.4	14	0.3	30	5.6	One adult specimen					
Caddisflies	Larva												
(Trichoptera)	Adult	4	0.6	21	0.2	20	3.7						
Beetles	Larva												
(Coleoptera)	Adult	1	0.4	14	0.5	16	9.3	One Dytiscidae					
Midges	Larva pupa	137	43	100	2.15	80	39.8	228	56	100	0.75	69	39.4
(Diptera)	Adult	3	0.15	14				One adult specimen					
Terrestrial Insects:													
Leafhopper (Homoptera)		One small specimen											
Beetle (Coleoptera)		2	0.14	7	0.1	20	1.9	2	1	66	0.25	12	13.1
Flies (Diptera)		2	0.4	7	...	...	...	One Rhagionidae					
Other Aquatics:													
Shrimp (Amphipoda)		26	3.3	38	0.55	45	10.2	2	0.7	33	0.1	8	5.3
Sow bugs (Isoptera)		2	0.2	14	0.05	14	0.9						
Fish eggs (Grayling)								30	5.7	33	0.6	33	31.6
Algae		...	...	36	0.55	58	10.2						

TABLE IV

A COMPARISON BETWEEN THE STOMACH CONTENTS OF TWO DOUBLES, EACH OF A GRAYLING AND A BROWN TROUT, CAUGHT BY FLY-CASTING IN THE MOUTH OF MEADOW CREEK - JULY 10, 1936.

Kind of Organism	Double		Double	
	Grayling 335 mm. Standard L.	Brown Trout 300 mm. Standard L.	Grayling 310 mm. Standard L.	Brown Trout 386 mm. Standard L.
Snails (Physa)				7
Waterfleas (Cladocera)	15			
Shrimps (Amphipoda)			1	1
Sow Bugs (Isopoda)	1	5		
Mayflies (Ephemeroptera)	1	1		
Damselflies (Zygoptera)			1	
Caddisflies (Trichoptera)			2	
Bugs (Corixidae)	1	1		
Beetles (Dytiscidae)	2	5	9	1
Midges (Chironomidae)	3		1	2
Fly (Anthomyiidae)			1	
Plant roots				2