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A comparison of the palatability of hatchery-reared and wild brook trout[1]

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Abstract

Objective organoleptic tests scoring for aroma, flavor, texture, and moisture, were made for eight samples of wild brook trout (Salvelinus fontinalis) from two streams and for seven samples of hatchery-reared brook trout from two rearing stations. Samples were obtained during May, June, July, and August, were cooked separately by the same method and identified by the judges by code number.

Average scores of six judges showed all samples acceptable but values for wild fish from both streams were significantly higher than for hatchery-reared trout. The color of the flesh and the overall appearance of the wild trout were also more attractive.

The possibility of improving the eating quality of hatchery trout through better nutrition was suggested.

Introduction

There has been considerable discussion of the relative palatability of wild trout versus those recently liberated from fish hatcheries. This discussion is of vital interest to those responsible for fish-management policies. The recent trend in Michigan toward planting legal-sized trout in streams shortly before and at intervals during the fishing season has resulted from studies of the survival of hatchery-reared fish stocked at various times of the year, (Hazzard and Shetter, 1939; Shetter, 1946). These studies indicate that the angler catches a greater percentage of the fish stocked when legal-sized fish are planted just prior to and during the fishing season. This trend, however, has intensified the controversy as to the comparative eating qualities of wild and hatchery-reared fish.

The present study was organized in an effort to evaluate as objectively as possible the relative palatability of hatchery-reared and wild brook trout (Salvelinus fontinalis). It was organized and carried out jointly by the Institute for Fisheries Research, Michigan Department of Conservation and Michigan Agricultural Experiment Station and Departments of Food and Nutrition and Zoology, Michigan State College[2].

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[2] Fish were captured, dressed, and shipped by members of the Conservation Department. The fish were prepared for cooking and the panel of judges notified and assembled by P. I. Tack of the Zoology Section of Michigan Experiment Station. The fish were prepared, cooked and served and the scoring supervised by Miss Helen A. Baeder of the Food and Nutrition Department of the Michigan Experiment Station.

Materials and methods

Brook trout from four sources were used in the experiment. The wild trout were obtained from Hunt Creek and the East Branch of the

Au Sable River in the northern part of the lower peninsula of Michigan. No trout had been planted in these streams for several months or longer and the fish were regarded as wild. The hatchery-reared trout were obtained from the Grayling State Fish Hatchery and the Harrietta State Fish Hatchery. All fish had the entrails and gills removed at the time they were killed. They were then wrapped in waxed paper, packed in cracked ice and shipped to the Zoology Department of Michigan State College, East Lansing. Shipments were by express and were in transit only 10 to 12 hours. All lots except one arrived in good condition with ample ice. The last shipment from the Harrietta Hatchery was delayed, arrived without ice and was discarded. The fish were forwarded by previous arrangement in order that the judges might be available and the workers ready to prepare them.

The samples were collected at intervals of about one month throughout the period of the open fishing season. Four samples were judged during the course of the summer of 1944 as follows: May 23, June 16, July 14, and August 17.

Upon arrival in East Lansing, the fish were cleaned, prepared for cooking, and wrapped in vegetable parchment for delivery to the home economics food laboratory. The cooking was done by one person except for the trial on August 17. The preparation consisted of washing and drying the fish, then salting them lightly inside and out.

The brook trout were cooked over a low flame in heavy iron skillets containing 1-1/2 to 2 tablespoonsful of melted hydrogenated vegetable fat. They were cooked until brown on one side, then turned and cooked until brown on the other. The fish from each source were fried separately.

Special attention was given to the selection of trout of a uniform size. The cooked fish were served to a panel of judges who had been selected and assembled for the purpose of scoring them. Each judge was provided with score sheets on which were listed four factors: aroma, flavor, texture and moisture. Each factor was followed by seven columns headed by adjectives describing the factor in descending order from very desirable to very undesirable. The columns were numbered from one to seven, one being the lowest possible score and seven being the highest. This sheet was modified from the chart used by home economists for judging meats[3]. Average scores were calculated for each sample (Tables 1 and 2).

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[3] National Cooperative Meat Investigation. Committee on Cooking and Palatability Methods for Meat, United States Department of Agriculture, Washington, D. C.

Six judges were selected as far as possible for previous experience in judging foods. An effort also was made to keep the panel balanced at half women and half men, and to keep the same judges throughout the entire experiment; this arrangement was not always possible.

The fish were identified by a code so the judges were not aware of the source of the fish they were judging. After the judging was completed, the source of each sample was identified and the judges discussed the samples. Some of the significant comments will be mentioned in the later discussion.

The hatchery-reared brook trout were 2 years old and had been fed a diet composed of beef and pork melts and horse meat. This diet had been fed for about 1-1/2 years. All the fish ranged from 7 to 10 inches long.

Table 1.--Mean scores of organoleptic tests on hatchery-reared and wild brook trout

Source and type of fish	Date of judging	Aroma	Flavor	Texture	Moisture
Au Sable River (Wild)	May 24, 1944	5.83	5.33	5.50	5.50
	June 16, 1944	6.00	5.16	5.33	5.83
	July 14, 1944	6.33	6.50	6.00	6.16
	August 17, 1944	6.33	5.83	6.17	6.00
Average		6.13	5.71	5.75	5.88
Hunt Creek (Wild)	May 24, 1944	5.66	5.66	5.83	5.83
	June 16, 1944	5.83	5.66	5.66	6.00
	July 14, 1944	6.50	6.50	6.33	6.33
	August 17, 1944	6.50	7.00	6.83	6.67
Average		6.13	6.21	6.17	6.21
Grayling Hatchery	May 24, 1944	5.50	4.66	6.00	5.50
	June 16, 1944	5.00	4.50	4.66	5.16
	July 14, 1944	5.16	5.00	5.33	6.00
	August 17, 1944	5.17	4.67	5.83	5.67
Average		5.21	4.71	5.46	5.58
Harrietta Hatchery	May 24, 1944	5.50	4.83	5.66	4.66
	June 16, 1944	4.33	3.33	5.00	5.00
	July 14, 1944	5.00	4.00	4.83	5.33
Average		4.94	4.06	5.19	5.00

Table 2.--Mean palatability scores and standard deviation of the scores for wild and hatchery-reared brook trout.

Source and type of fish	Aroma	Flavor	Texture	Moisture
Au Sable River (Wild)	6.13±.21	5.71±.26	5.75±.24	5.88±.19
Hunt Creek (Wild)	6.13±.21	6.21±.26	6.17±.21	6.21±.17
Grayling Hatchery	5.21±.22	4.71±.24	5.46±.24	5.58±.24
Harrietta Hatchery	4.94±.34	4.06±.38	5.19±.26	5.00±.26

Comparison of scores for wild and hatchery-reared brook trout

The values given in Table 1 are the mean values of the scores of six judges. They are useful in showing any possible variation of scores through the period of the experiment. An examination of individual scores shows rather close agreement within each group. Perhaps the most effective way of making comparisons is to take up one factor at a time.

Aroma--The average score for the aroma of wild fish is the same from both sources (Table 2). The score for the hatchery-reared fish is slightly in favor of those reared at the Grayling Hatchery although the advantage over brook trout from Harrietta is not significant. In every case, the difference between the wild fish and the hatchery fish is significant (Table 3). It is apparent that the judges regarded all samples favorably since all values fall above four, below which would be considered unfavorable.

Flavor--The scores for flavor showed significant differences between wild and hatchery-reared brook trout. The fish from Hunt Creek had a score considerably higher than the hatchery-reared fish and somewhat higher than the wild fish from the Au Sable River. They also rated progressively higher during the season. The fish from the Harrietta Hatchery were just acceptable while the rest were regarded as being desirable. The judges, however, did regard all wild fish superior to the hatchery-reared fish.

Texture--The texture of the flesh may seem to be of little importance so far as quality of the fish is concerned, but some of the comments of the judges indicate that it is worthy of consideration. The judges

Table 3.--Values of t between wild and hatchery-reared brook trout.

Sources of fish	Aroma	Flavor	Texture	Moisture
Au Sable River and Grayling	1/ 3.68	1/ 2.86	0.85	0.97
Hunt Creek and Grayling	1/ 2.88	1/ 4.29	2/ 2.22	2/ 2.10
Au Sable River and Harrietta	1/ 3.72	1/ 3.75	1/ 5.09	1/ 2.67
Hunt Creek and Harrietta	1/ 3.05	1/ 4.89	1/ 8.91	1/ 4.17

1/ The probability that this is a chance variation is less than .01.

2/ The probability that this is a chance variation is less than .05.

evidently considered the texture to be better than acceptable. The differences were all significant except in the comparison between the Au Sable and Grayling fish; yet, the average scores for texture were higher for wild fish from Au Sable River than from Grayling Hatchery.

Moisture--The scores for moisture show significant differences between the wild and hatchery-reared fish except between the fish from Au Sable River and Grayling Hatchery. Again the average scores from the Au Sable River were higher than from Grayling Hatchery.

Miscellaneous comments

One noticeable feature in the cooking of the fish for these trials was the fact that the skin came off the hatchery-reared fish thus preventing browning. The wild fish retained their skin and browned nicely.

The wild fish had much more highly colored flesh than did the fish from the hatcheries. Furthermore, those from Hunt Creek were more highly colored than those from the Au Sable River. The fish from Hunt Creek had a deep pink flesh while those from the Au Sable were only moderately pink. The hatchery-reared fish had a creamy white flesh.

The flesh of the hatchery-reared fish had a peculiar quality which was described by some of the judges as tacky. That is, there was a tendency for the flesh to cause the judges' teeth to stick together somewhat as they do when chewing a caramel.

Conclusion

The results of these tests suggest that there is room for improvement in the nutrition of cultured trout if the hatchery product is to equal that of natural waters.

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