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1994 Grant Final Report

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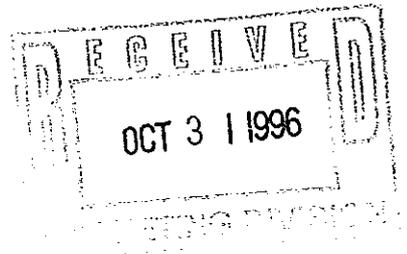
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## ARCTIC CHAR CULTURE IN WISCONSIN

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FINAL REPORT  
Sept. 30, 1996

The arctic char were stocked into a raceway pond in December 1995. Good growth continued and one pound fish were ready for harvest by mid-June 1996.

A second group of 40000 char eggs was started incubating in January 1996. A good hatch was accomplished although significant mortality was experienced during early feeding stages. The loss of the fish appeared to be food related. Even though feed was always available to the fish, many refused to eat. Palatability, appearance or size of the feed was the most likely problem.

We did not experience mortality at this stage with the previous group of char. That group was fed a starter diet (Biodiet brand) that is considered higher quality than the what was fed to this group. We fed the second group the same diet we use for rainbow trout (Ziegler brand).

High mortality during early life stages is a problem Canadian char growers told us to expect. Since the fish are only two generations out of the wild much work remains to be done with regard to genetics, selective breeding and general culture techniques.

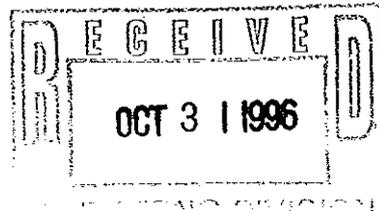
When they are removed from the hatchery, a count will be taken to determine the mortality rate. We estimate mortality is near 60%. There were no other high mortality problems with this group. The remaining fish continue to exhibit the good growth shown by the previous group.

From June to September some of the char were sold to our most valued customers. These customers were typically fine dining restaurants. The fish were sold as 10 ounce butterflied boneless portions. There was a great deal of interest in this new product, but sales tapered off after an initial surge. Feedback from the customers indicated that the char were close in taste and appearance to our rainbow trout. Marketing strategies are being developed to get sales in step with production. Smoking, value-added cuts (fillets, pinboned etc.), and larger portions are some options being considered. Setting a price is especially challenging since the product is so unique.

Even though mortality and marketing remain unanswered questions the project produced good information for those interested in growing arctic char in Wisconsin.

### CONCLUSIONS

- Char can be grown in much the same manner as rainbow trout. No special equipment is needed. Any hatchery that can raise trout should be able to raise arctic char. This is

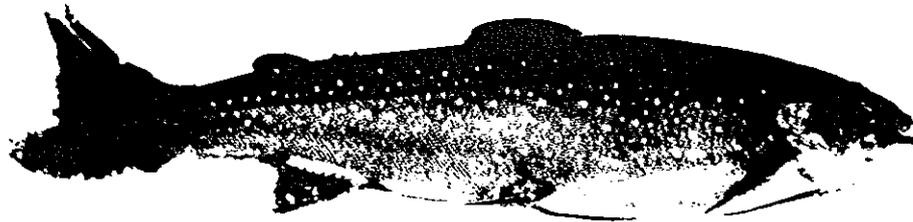


Final Report  
Conclusions continued:

- contrary to our preliminary investigation into culturing arctic char. Canadian char growers reported that incubation temperature should not exceed 42 F. Our experience showed the hatch went better at 50F than 42F. This means no special chilling apparatus is required for incubation. Rearing pond temperature should not exceed 65F.
- Char grow well in winter. This should be especially interesting to farmers in northern Wisconsin. Growth did not slow down because of cold water or short days.
  
  - Char grow well in crowded conditions. We had excellent growth (about 1 inch per month after stocking in raceways) even though we stocked the char raceway 28% over capacity. Our char took 15 months to grow from egg to 13 inches. Our rainbow trout take about 16 months to reach the same size.
  
  - Arctic char have a much more sensitive slime coat than rainbow trout and care should be taken when handling that they do not come into contact with any dry surfaces.
  
  - Char can be handled, graded and penned in the same manner as rainbow trout. The char does not struggle violently as trout tend to do. Therefore mortality is not a problem after handling episodes.
  
  - Pigmentation of arctic char flesh to its characteristic salmon-pink color, which is accomplished by feeding carotenoid-laced food, takes much longer than rainbow trout. Four months is needed for this process, which takes only six weeks for rainbows.
  
  - One of the biggest challenges of the project was the legal importation of the eggs from Canada. Be certain that all agencies involved are completely satisfied well before the shipping date. Using a licensed custom broker to handle importation is the best way to avoid many headaches.

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## ARCTIC CHAR CULTURE IN WISCONSIN - AN UPDATE



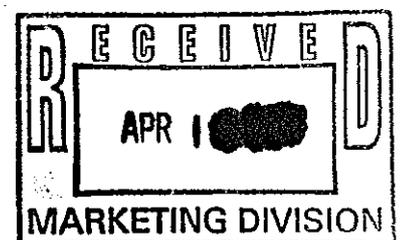
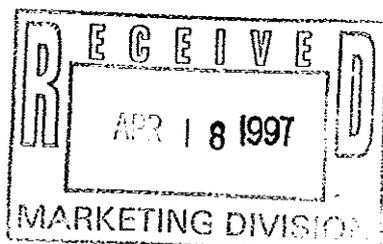
Sponsored by The Wisconsin Department of Agriculture, Trade and Consumer Protection  
Written by Dave Mueller, Rushing Waters Fisheries Inc.

This project is an attempt to diversify aquaculture opportunities for Wisconsin trout growers. The main goal of the project is to find an alternative cold water fish species that can be raised in much the same way as trout, yet perform or sell at least as well as our present selection, mainly rainbow trout.

Inquiries into the best candidate species led to the Arctic Char (*Salvelinus alpinus*). This species is being farmed in increasing numbers across Canada and northern Europe. It is just now starting to grow in popularity with American producers. The taste of Arctic char is described to be slightly more flavorful than trout but not as flavorful as salmon. Farmed Arctic char sells at a slightly higher price than farmed rainbows of the same size. Char growth is said to be better than rainbows, especially in very cold water and during winter months. A survey of our customers revealed good interest and a willingness to buy Wisconsin grown Arctic char.

We don't expect all trout farms (or growers) to be suited for Arctic char production. Each farm has different physical and design characteristics that play a major role when determining suitability. Dealing with regulatory agencies can be intimidating. The early life stages are unpredictable and the cost of char eggs is much higher than rainbow eggs. Despite the drawbacks, char culture can be a viable alternative to raising traditional cold water species.

During the winter of 1994 we initiated the process of getting Arctic Char on our hatchery license. The main obstacle to clear for this problem was to submit to the WDNR an Environmental Assessment. This is a standardized form they use in preliminary investigations of a variety of environmentally sensitive undertakings (such as landfills and mines) that may require an Environmental Impact Study at a later date. In our case, escapement and the introduction of disease were the most obvious risks. To satisfy the escapement question, we planned to keep the fish secured at the farm by using screens, bars, and by keeping the fish in upstream raceways. We also pointed out, that since our farm discharges into the warm waters of the Rock river watershed, any escapees would be unlikely to survive summer temperatures. Disease worries were eliminated by agreeing to import eggs certified disease free by the Canadian Department of Fisheries and Oceans.



Understandably, the WDNR isn't enthusiastic about bringing exotic species into the state. Nevertheless, they were cooperative and helpful as they realized we were not doing this on a whim and intended to proceed openly and leagaly.

During the same time, we started investigating culture techniques necessary to raise the Arctic Char. Most of the literature I found was not very useful. There was a great deal of scientific papers dealing with the biology of natural populations or laboratory studies like stress and biochemical regulations. I am sure there is some "how to" manual on Arctic char, but I was unable to find one.

I ended up getting much of my information directly from Canadian char growers. By using the "Aquaculture Buyer's Guide", I found a few char egg suppliers (all located in Canada) and phoned them regarding the availability of eggs and discussed with them char culture techniques. With few exceptions I found that they were extremely cooperative and talking with them was very easy. It's hard to recall for sure, but I believe all of them said that if I could raise brook trout, I could assume Arctic char would be no different. This made sense since, they are close relatives (Arctic char is listed in the same genus as brook trout and lake trout).

The price and terms of the eggs' sale varied widely from supplier to supplier and all required a deposit, sometimes months in advance, to reserve eggs. No supplier could guarantee he would have eggs available for sale. They all complained about the fickle nature of their Arctic char broodstock. Some told me that the females do not spawn every year and unpredictable weather disturbs the process. Prices vary from \$80 to \$190 (Canadian dollars) per thousand eggs.

After getting the char put on our license and finding a supplier who met our criteria, the Importation Phase had begun. We made contacts with US Customs, USFW, US Dept Of Ag. and WDNR. The Canadian Dept. Of Fisheries and Oceans, requires the exporter to supply a Title 50 export form that is filled out by their local fish health specialist. Permission to import into the country is needed from US Customs and the USFWS. The WDNR also requires a permit for importing out-of-state fish. We arranged for a delivery in late February 1995.

In our case, there was a lot of confusion with clearing Customs. (I learned too late that there is a such thing as a customs broker who would have streamlined the process.) All agencies were helpful and cooperative. US Customs and USFW went the extra mile for us as complications arose when the eggs arrived at the airport.

The eyed eggs were about the same size or slightly smaller than typical rainbow eggs. The Von Bayer count was 63 (4.8mm). We incubated the eggs in a Heath hatching cabinet. Water chillers kept temperatures at 43 degrees F, which the Canadians said was best. The char growers told me that it is important to incubate the eggs in water no warmer than 45 degrees F and preferably 43 degrees F. Therefore, we had to plan a chilling system for our 50 degree F water supply. Later on in the project we found the chilling system to be unnecessary (more on that later).

The performance of our eggs was very disappointing. Upon arrival, viability was about 81%. Hatching started in 5 days and proceeded for an agonizing 15 more. We picked 5,820 morts (out of 19600 shipped) during the hatch. The supplier acknowledged he was having the same problem with the eggs he kept and he reimbursed us for the high mortality. Parental health and/or genetics was brought into question as we started to notice hundreds of two-headed sac fry along with many other deformities.

We began to introduce starter mash when the yolk sacs were about half absorbed. The char did not swim up the same way the rainbows do. They progressed from sluggish sac fry to first-feeders that are bottom oriented for a few weeks. We verified feeding by checking backlighted samples for full guts. Mortality remained high as the deformed sac fry used up the last of their reserves and died. We raised temperatures to 50 degrees F(ambient), after swim up. Feeding and growth then resembled rainbows. By that point mortality was well over 50%. Gradually mortality diminished and the remaining fish grew very well. They fed eagerly from both belt feeders and thrown feed.

After 180 days the char's growth surpassed our rainbow's rate. Keep in mind the char were less crowded than our high production rainbows (100,000 quarterly) and we may have tended to give the char better care because of the novelty of the project.

The char were stocked into a raceway pond after 9 months in the hatchery. Total number stocked: 5,500. They immediately started to use the demand feeder and took thrown feed.

The pond performance of the char was excellent. Their growth was good and mortality was negligible. The char tended to distribute themselves more or less evenly throughout the raceway. No tight schooling as the rainbows do. They were more sensitive to nearby movement but still took thrown feed.

The char took moving and grading very well with one exception. While transferring the char into a raceway about a dozen were dropped onto dry grass, which is common when handling many netfulls of fish. As we do with rainbows, the dropped char were flipped into the raceway. Those fish quickly developed skin infections. Some recovered, some did not. We concluded, the char have a much more sensitive slime layer than rainbows. Except for those mortalities, death from moving episodes was non-existent.

Grading char for market is almost a pleasure when compared to rainbows. We use an open bottom grading box with bars spaced at 1 inch intervals. Lifting the box out of the water to "shake out" the smaller fish usually results with workers being covered with a combination of water, fish, slime and feces. Not so with the char, which squirm in the box in a snake-like manner, splashing very little. As with rainbows, mortality is very low and usually the result of being stepped on by workers or trapped under the seine net.

We found the char took much longer than rainbows to deposit pigment in their flesh. It took the char almost 4 months on feed laced with pigment (canthaxanthin) to start turning red. The males tended to deposit pigment in their skin, turning their lower flanks a bright orange-red. The females retained their purple-violet color and the flesh took pigment faster than the males.

At 15 months the largest char in the raceway were 13 inches long which yielded a 10-12 oz. product (head on, boned). Our restaurant customers were eager to put char on the menu but after an initial flurry, sales dropped off sharply. Customers reported slow sales due to trout-like appearance and taste, but at a much higher price. Others cited the relatively unknown status of the arctic char to the general public.

Our '96 group of Arctic char started much better than the '95 group. The '96s were from a supplier in British Columbia who was a far better source. Viability upon arrival was 98%. This group was split and incubated at 50 degrees F and 43 degrees F. As the hatch started and progressed, it became apparent that the 50 degree F eggs were hatching quickly and with fewer morts than their colder counterparts. We decided to disconnect the chillers after it became apparent incubation at 50 degrees F was resulting in less mortality and a quick hatch (this hatch took 7 days - mortality was 7%).

This group progressed into swim-up stage without problems. Shortly after though, we started noticing there were many emaciated fish and they started dying off. We did not have a problem at this stage with the previous group. We were giving this group Zeigler Salmon starter mash while the previous group received Biodiet. There were no flared gills or lethargic behavior indicating problems other than starvation. Feed was always available to the fish. Mortality stayed high for several weeks and subsided after we lost about 60% of the fish.

The survivors performed well as the previous group did. We are expecting harvest to start at 15 to 16 months (1 lb. fish).

A third group has been started this year. They are now at swim-up and are showing no signs of feeding problems (they are being fed Biodiet). Mortality to date is probably less than 5%.

As previously stated, customers who initially showed much interest in the product were reluctant to reorder. Reports came back saying the char tasted too much like trout to justify a higher price. They also said arctic char is not well known to the general public. We have since realized some errors in our marketing strategy.

With great demand for the first char sales, we priced the fish higher than we should have. Later, lowering prices brought in a few customers, but many were probably lost for good. Low initial prices would have most likely resulted in more return business and given the char greater exposure.

Recently, two Chicago-area seafood distributors started buying our char in amounts sufficient to sell us out of our production in three months. Char prices to wholesalers are lower than they would be to restaurants, however they remain higher than our price for rainbows of the same size. It is to be hoped that, demand will increase as a result of these sales.

There are plans to increase demand for Wisconsin raised arctic char through various promotional venues, such as trade shows and advertisements. We have also started conducting a feed trial to see if taste and pigmentation problems can be solved with high fat feeds.

Please feel free to contact me if you have questions regarding Arctic char or this project.

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# *Rushing Waters*

**FISHERIES, INC.**

October 21, 1997

Subject: Arctic Char Culture In Wisconsin - Phase 2 / Final Report

## How Fat In Feed Affects The Taste Of Arctic Char:

The original intent of this project was to assess taste differences in two groups of char fed a different fat content. Our second age class of 10,500 char were split into two equal groups. For the purpose of this study the groups are labeled "F" and "F2". Group "F" was fed a high fat feed 46% protein, 18% fat, 4% fiber. "F2" was fed a standard trout diet of 38% protein, 12% fat, 4% fiber.

Experience gained from marketing our first age group of char clearly told us that the taste of fresh char was too similar, to trout grown on our farm. This caused us to determine that we were unable to command a premium price for the Arctic Char. Retail outlets, such as fish counters in grocery stores, maintained a small but consistent demand for a larger (one pound) trimmed fillet. Restaurants, after an initial flurry of interest, for the most part, stopped demanding char because the taste was too close to that of trout.

Our restaurant clients include the high end restaurants and chefs in the Madison and Milwaukee area. This study was designed to see if we could satisfy their desire for exotic, Wisconsin farm raised fish that has a different taste than trout.

In March 1997 our feed trial started. All of our ponds are equipped with fiberglass hopper demand feeders. These feeders hold one hundred pounds of feed and were filled when empty. Feed was continuously available to the char.

The char were fed their separate diets through August. No differences in growth rates were noted. External coloration was greater in the "F" fish. Starting in late June, low level consistent mortalities (7-12 fish per week), were noted in the "F" fish. No mortalities were noted in the "F2" fish. Because of the consistent pattern of mortalities, we contacted Dr. Myron Kebus of Wisconsin Aquatic Veterinary Service. We asked him to take a look at the char on the farm and to perform a health assessment and organ histopathology. A copy of Dr. Kebus's report is attached and further discussion will follow in conclusion.

During August we contacted a number of our restaurants and chefs to discuss their participation in a blind taste test. Together we came up with some simple ground rules. The restaurants that wished to participate, would receive 6-12 fillets of group one the first week and then 6-12 fillets of group two the second week. The fish were to be prepared simply, such as broiling, steaming or sautéing, and served to the waitstaff. Verbal comments and observations would be gathered by the chef and I would interview the chef on week three. Because of the subjective nature of taste I felt food professionals would give us a clearer understanding of the nuances of taste, texture, flakiness, etc.



# Rushing Waters

FISHERIES, INC.

The samples sent out first were the low fat "F2" fish; the high fat "F" fish were sent out the second week. All participants prepared their samples in the same manner both times. The chefs and waitstaffs appreciated the free fish and enjoyed the quality of the product we sent them. During the interview process all participants were asked to describe any differences that may have been noticed between the two samples. Try as they might; no one person could find any difference between the two samples. Almost all of the participants were convinced that these were the same fish. Taste, texture, and flakiness differences, could not be distinguished between these two groups of arctic char, even by trained palates.

Personally I have sampled these two groups throughout the study, hoping to notice a change in taste. I was hoping to notice a change in sweetness or in the density as you bite into the flesh. I could not find any difference. In talking to the chefs, I received positive feedback on preparation and most of us agreed broiling the fresh fillets brought out the best flavors in the fish.

Rushing Waters currently smokes thousands of pounds of salmon and trout per week. When our trout and char are cooked fresh side by side, no real difference is noted. However, if a batch of trout and char are smoked together a wonderful overall difference is noticed. The smoked Arctic Char is far superior to the trout; and personally, it is some of the best smoked fish that I have ever had. When the "F" char and "F2" char were smoked, we had hoped to find an overall difference in the finished product. Unfortunately, there is no difference between the two groups even when smoked. I had thought the higher fat fish would definitely show more personality when smoked but sadly they did not.

### Conclusion:

The taste of Arctic Char was not affected by the change in diet studied. Both feed groups taste remained similar to our fresh trout and did not distinguish between the different diets.

Arctic Char is still an efficient feed to flesh converter for the cold water hatchery. Other farms might have more natural feed in their ponds that could make a taste difference. Other farms may have a different marketing approach that could be successful.

Arctic Char is a good high quality fish that can be grown efficiently in a cold water hatchery. Arctic Char is good tasting when prepared fresh and it is a superior quality smoked product. We will continue to raise char on this farm but will probably look to market it as a value-added smoked fish product.

Respectfully Submitted,

A handwritten signature in black ink that reads "Scott Barnes". The signature is written in a cursive, flowing style.

Scott Barnes  
Operations Manager / Rushing Waters Fisheries



# *Rushing Waters*

**FISHERIES, INC.**

The mortalities noted in the fish fed the high fat diet was an interesting offshoot of this feed study. Dr. Myron Kebus examined both groups and authored the attached study. We assumed that the char fed a normal trout diet were doing just fine and the high fat fish were experiencing some type of organ failure. However it was just the opposite, the trout diet fish showed significant liver damage and the high fat did not. The mortalities in the "F" fish could not be readily explained. Much work remains to be done on char diets.

# Health Assessment of Arctic Char Feed Two Different Diets

Myron J. Kebus, M.S., D.V.M.  
Wisconsin Aquatic Veterinary Service  
Madison, WI

*Abstract*-growth of arctic char was similar despite differences in diets. Diets appeared to affect morbidity. Evidence of nutritional imbalances/deficiencies were present.

## Introduction

The findings described here are the result of Health Assessments performed on arctic char at Rushing Waters Fisheries, Palmyra, Wisconsin on September, 5, 1997 by Myron Kebus, M.S., D.V.M...

## Materials And Methods

Twenty 18-month old arctic char from two treatment groups were assessed using the Health Assessment Index(HAI) modified by Wisconsin Aquatic Veterinary Service. Rushing Waters Fishery(RWF) obtained arctic char eggs from Sun Valley Trout Farm, Mission, B.C., Canada. These eggs were hatched at RWF and raised in tanks and two production ponds. The F-1 group was housed directly upstream from the F-2 group.

Both groups were feed 3/16" pellets manufactured by Zeigler Bros., INC., Gardners, PA. Group F-1 was feed Pigmented HE Trout 46/18 W/1.0#/Ton Carophyll Pink. This diets is labelled as: crude protein 46.0%Min, crude fat 18.0%Min, crude fiber 4.0%Max. Group F-2 was feed Pigmented Trout Grower HI-Fat 38/12. This diets is labelled as: crude protein 38.0%Min, crude fat 12.0%Min, crude fiber 4.0%Max.

## Results

### Subjective

The majority of fish from both groups appeared alert and active, and only minor lesions were visible at pond-side. Several moribund fish from F-1 were

extremely lethargic and observed severely gasping near the raceways edges. The F-2 fish appeared generally less colorful than the F-1 fish. No other subjective differences were noted.

### Objective

*Growth*-Total average length(range) for F-1 and F-2, respectively were: 12.4"(10.4-13.9"), and 12.5"(10.9-13.7"). Total weight(range) for F-1 and F-2, respectively were: 11.9 oz.(6.4-17.3oz.), and 12.0 oz.(7.1-17.0 oz.). There is no significant difference in growth between the two treatments groups.

*HAI parameters*-No organ abnormalities were noted on either group on pseudobranchs, thymus, or kidney. One fish from F-1 showed blindness in the left eye. Gill abnormalities were comparable: F-1 had two fish with slight abnormalities, and one with moderate abnormalities, while F-2 had two with slight abnormalities. Both groups showed some fish with black, rough-surfaced spleens: seven from F-1, and five from F-2. Histopathology was unremarkable. Internal body fat varied more in F-2: 2(0-25%); 2(25-50%); 3(50-75%); and 13 (75-100%). The F-1 group had 1(25-50%), 10(50-75%), and 9(75-100%).

Hemorrhagic hindguts were more common in F-1 at 75%, compared with 50% of the F-2 fish. Histopathology of F-2 fish showed moderate cell degeneration of the intestinal epithelial mucosa associated with hemorrhagic hindguts.

No liver abnormalities were noted in F-1 fish. Eleven of the twenty F-2 fish had slight to moderate degrees of pale livers. Histopathology showed moderate to severe fatty degeneration of the hepatic tissue.

Sex ratios and levels of maturity were comparable between groups. Slight to severe fin erosion affected the majority of fish from both groups in comparable degrees.

Morbidity exam- moribund fish from F-1 showed gill lesions including generalized paleness and multiple small very pale lesions. Histopathology showed multiple areas of capillary endothelial damage. Livers were pale, and histopathology showed fatty degeneration of the liver. The most striking finding was a diffuse pattern of severe petechial hemorrhages on the swimbladder surface and peritoneal surfaces. Histopathology was unremarkable. No significant pathogens were noted.

## Discussion

There was no significant difference in lengths, weights, or sexual development. The F-2 fish had more fish with maximum internal body fat compared with F-1. Hemorrhagic hindguts were very common, however the cause was unclear. The major organ difference was the evidence of pale livers due to fatty degeneration in the F-2 fish in comparison to none in F-1. Fatty degeneration of liver cells can be due to numerous factors, certainly not only fat levels in the diet. Nutritional imbalances and deficiencies can contribute to fatty degeneration. The two diets differed in crude protein and crude fat therefore it is difficult to determine optimum levels of either nutritional parameter.

The results suggest that a relatively high protein, high fat diet(48/16) does not significantly affect growth of arctic char. However, there are indications that this may not be an optimum diet. A presumptive diagnosis of the disease effecting the arctic char feed relatively protein, high fat diet(48/16) is nutritional deficiency/imbalance.

# ARCTIC CHAR

If you're ever in the mood for a fish Popsicle, the Arctic char would be an ideal choice. In fact, the Inuit of northern Canada have enjoyed char that way for hundreds of years. But today's chefs are finding plenty of other ways to serve this little-known prize of many fish lovers.

With a succulent texture and a distinctive flavor somewhere between salmon and trout, Arctic char (spelled charr by some) is adored more than salmon in some circles. In Canada, it has become an official banquet food for many affairs of state and is even served to the Queen of England when she visits. And a few years ago, Hillary Rodham Clinton requested Arctic char for the first state dinner at the White House.

A beautiful, silver fish, pink-dappled along its underside, often with brilliant shades of blue and green on the back and upper sides, Arctic char is closely related to both salmon and

trout and has many characteristics of both.

Like salmon, Arctic char is anadromous (unless landlocked), migrating from lakes to salt water in late spring and returning in late summer to spawn. It can also grow salmon-sized in the wild (up to 25 pounds). But Arctic char lives up to 25 years instead of dying after spawning. Its nearest cousin is the Dolly Varden trout, from which it is almost indistinguishable.

Regardless of the char's place in the great wheel of life, chefs and gourmands agree: it's delicious. And thanks to a new abundance of farm-raised Arctic char from Canada and Iceland in the past five years, the fish is becoming more and more popular—both in fancy restaurants and at the dining-room tables of people lucky enough to find it at their fish markets.

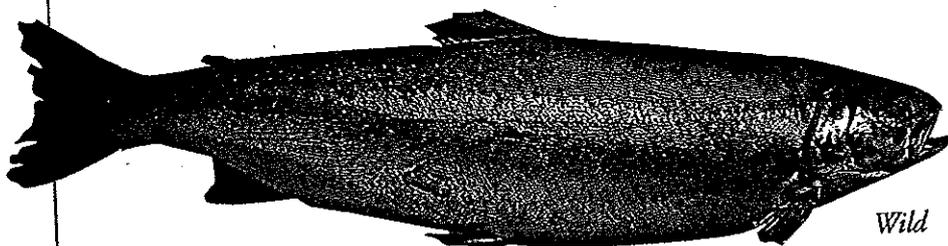
Unfortunately, it can still be hard to find Arctic char in the Lower 48,

and its rarity makes it expensive. But market demand is growing as people taste it in their favorite restaurants, and thanks to aquaculture, Arctic char is increasingly available year-round. You just have to keep your eyes open, haunt your local high-end supermarket—and if you don't find it, ask your seafood counter to find it for you. The taste is worth the price.

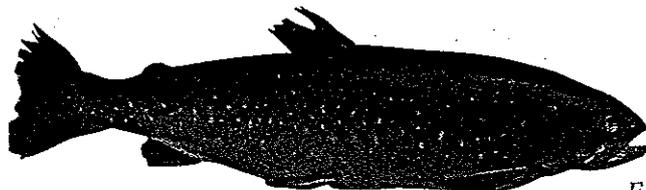
 Farm-raised char is available fresh year-round, whereas wild char hits the market for only a month or so in the fall. The main thing to remember when shopping for char is that the color of the flesh varies dramatically from wild to farmed and from one farm to another. (Wild char, especially, can vary tremendously, since it's been through a lot more on its way to salt-water and back.) The flesh of Arctic char can be anywhere from dark red to quite pale pink, but should be clear and unmarred. Look for bright, silvery skin with white or pink spots and a fresh, clean scent.

 Although wild char can grow to 25 pounds, they are usually 5 to 10 pounds on the market when available. Most farmed char is sold whole at 2 to 6 pounds. It's also increasingly available dressed and filleted.

 Arctic char live around the globe in the icy lakes and rivers above the 60th parallel—in northern Alaska and Canada, Greenland, Iceland, Norway and Siberia. Most of the char on the U.S. market, both farm-raised and wild, comes from Canada and Iceland.



Wild



Farmed

Arctic Char *Salvelinus alpinus*



Because it is less widely available and takes longer to grow to edible size, farmed Arctic char is generally more expensive than salmon. The small wild run can be comparably priced since its season is so short. Farm-raised char, which is more consistent in quality, can cost between \$8.99 and \$10.99 per pound for fillets at your local upscale or natural-food market. Since the supply is available year-round, the price is very consistent.



To know Arctic char is to love it. Many chefs adore char for its light, distinctive flavor (again, somewhere between salmon and trout), flaky-to-firm flesh and amazing versatility, making it a hit in upscale restaurants. The high fat content necessary for its life in the cold north means lots of flavor and moisture. A particularly delectable treat is smoked char, for which the biggest, most flavorful wild fish are saved.



Arctic char is a higher-fat fish than many, with 7.9 grams of fat per 3.5-ounce serving (only 1.7 grams are saturated fat, though.) The fish's fat content also gives each serving 1 gram of nutritious omega-3 fatty acid. Each serving also has 182 calories, 21.8 grams of protein, 27 mg. of cholesterol and 80 mg. of sodium.



You can use Arctic char in any recipe that calls for salmon or trout, or most other medium-firm, flavorful fish. Bake, broil, grill, poach, pan-fry or smoke—whatever sounds good will probably work (except deep-frying). If you buy a whole fish, it's easiest to fillet it right away, since the flesh softens a bit after a day or two. The skin becomes thick and leathery with cooking and should be removed before serving.

## Steamed Arctic Char with Spiced Carrots

The sweetness of carrots pairs beautifully with the rich flavor of Arctic char, and warmly flavored spices are a perfect complement to both.

- 8 ounces carrots, peeled and sliced
- ¼ tsp. ground coriander
- ¼ tsp. ground cumin
- ¼ tsp. ground ginger
- Pinch dried red pepper flakes or ½ tsp. chili sauce (or to taste)
- Salt and pepper
- 1½ pounds *Arctic char* fillet, skin and pin bones removed, cut in 4 pieces
- 2 green onions, thinly sliced
- 2 Tbsp. lemon juice

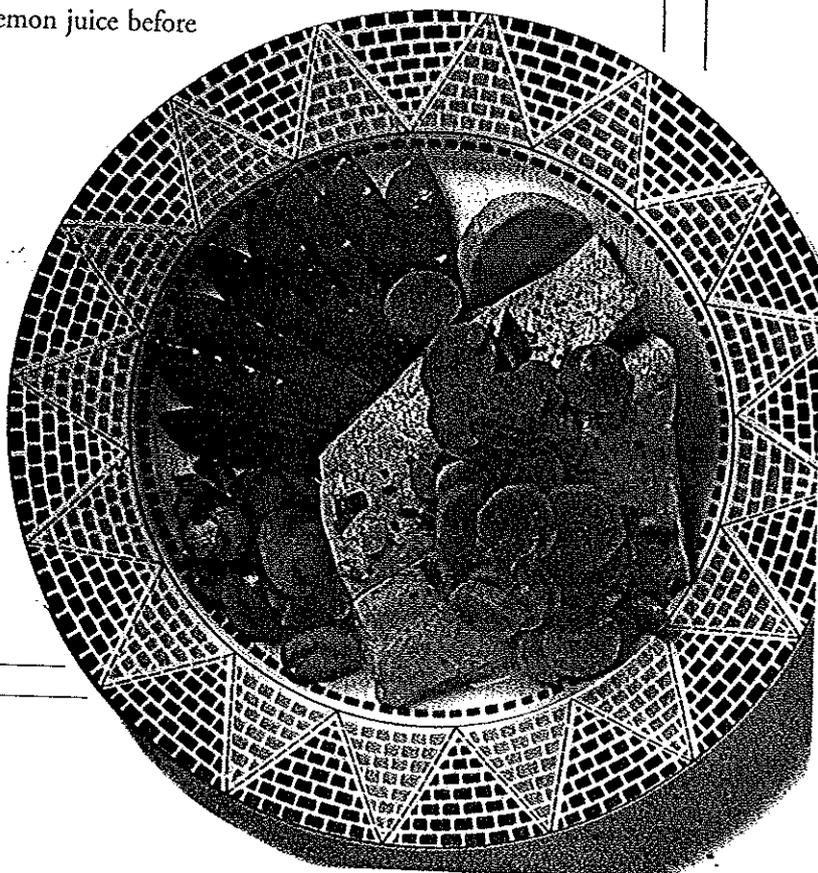
Put about 3 inches of water in the bottom of a steamer or a large sauté pan over which a steamer basket will snugly fit. Bring the water to a boil.

Combine the carrots, coriander, cumin, ginger and red pepper flakes in a medium bowl, add a pinch of salt and pepper and toss to mix. Transfer the spiced carrots to a heatproof plate that will fit inside the steamer. Steam over medium-high heat for 5 minutes.

Season the Arctic char with salt and pepper and arrange the fish pieces over the carrots. Continue steaming until the fish is just opaque through and the carrots are tender, 6 to 7 minutes longer. Transfer the fish pieces to individual plates and spoon the carrots over. Scatter the green onions over the carrots and drizzle with lemon juice before serving.

SERVINGS PER  
RECIPE: 4

Cal. 298 / Total fat  
14 g / Sat. 3 g /  
Chol. 46 mg /  
Sdm. 107 mg /  
Carbo. 7 g /  
Prot. 35 g /  
Om-3 1.7 g



## ECONOMIC CHAR INFO

The economic impact of char on this farm has not been all that outstanding. The exotic nature of char seems to have an appeal to chefs with a good culinary understanding. The market in our area does prefer a large 8 oz. fillet. At least twenty four months are needed to grow this size fish. Our trout reach market size is fifteen to eighteen months. There is no real monetary advantage in selling the char, so my current perspective is that I can turn a crop of trout around faster than char and save the additional six to nine months of fixed costs. Also I have concerns that the trout food given to the char is causing a diet deficiency that is negatively affecting the fish.

Because we have the ponds available to raise char we will continue to keep them on the farm. Our customers prefer larger fish and they wish their flavor was significantly different than our trout. The char is an excellent fresh product but is tremendous when smoked. In the future I believe almost all the char we raise will be sold as a smoked product.