

salt and fish, keeping the skin sides of the fish layers adjacent. With the top layer of fish, place the fish skin side up. Hold under refrigeration if possible. Do not store above 50°F (10°C).

Brine curing

Place sides of fish into saturated brine (about 1 part fine Kosher salt to 3 1/2 parts water) and completely submerge them with a clean weight or use a container that has a lid that can be used to keep the fish submerged during the entire brining process. Use about equal volumes of fish and brine. Place the top layer of fish skin side up. Hold under refrigeration if possible. Do not store above 50°F (10°C).

Pickling

4. Remove the surface brine by rinsing fish in cold fresh water using a process called “freshening.” Soaking the fish (not longer than one day) in cool, fresh water to reduce salt content may be desirable, but is not necessary. The length of freshening depends on the salting method used, the type of fish and size of the pieces, and the amount of salt desired in the finished product.
5. Remove the skin if desired. Some fish can be skinned easily prior to salting, but storage life may be reduced if this is done.
6. Cut fish into bite-size pieces or strips, as desired.
7. Place fish loosely in clean glass jars (*not cans!*) that have been sterilized with boiling water. Jars and closures (caps and liners) can be sterilized by placing them in boiling water for 5 minutes. Make sure to also sterilize a set of tongs for handling the jars and closures after they have been sterilized, so you will not recontaminate the jars. Cover with the pickling solution; put on lids; and keep under refrigeration until the bones soften (1 to 2 weeks).

A Basic Pickling Solution

Table 1 provides the formulation for a common pickling solution for a Scandinavian-style pickled herring. One gallon of solution will pickle 6 to 7 pounds of fish (about 2 gallons of finished product). Two liters of solution will pickle about 1.5 kilograms of fish.

IMPORTANT: Do not use less than one part vinegar to one part water. Do not pack fish tightly into

jars. Do not pickle more fish in a given amount of pickling solution than the amounts indicated in the preceding paragraph.

Storage

If you follow this basic recipe, you should produce a safe, good quality product. However, the fish must be stored under refrigeration (38°F (3°C) or lower) to provide an added measure of safety. This will ensure that food poisoning bacteria will not grow. Refrigerated storage also will retard bacterial spoilage, reduce problems with enzymatic softening, and reduce discoloration. If refrigeration facilities are limited, do not pickle more fish than you can consume in a few weeks.

For Further Reading

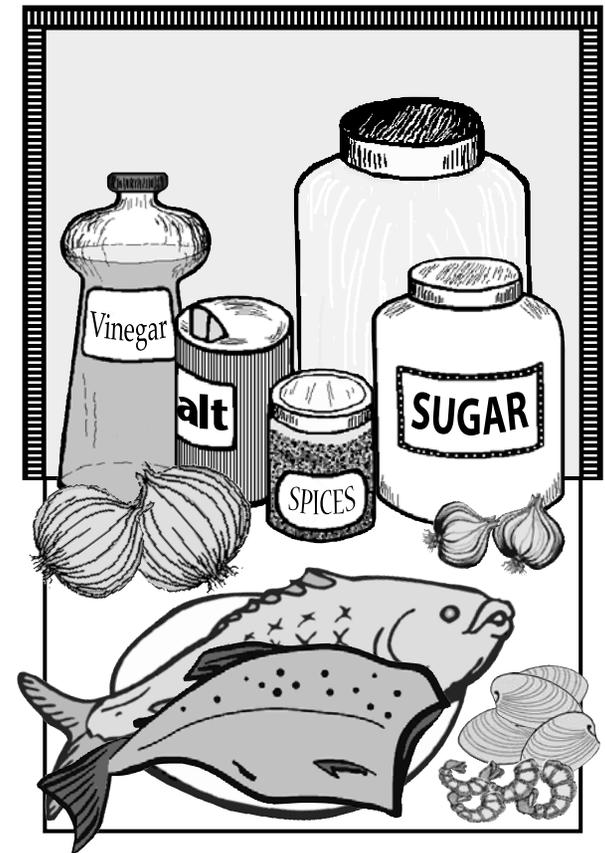
Canning Seafood, PNW0194
Smoking Fish at Home – Safely, PNW0238
Home Canning Smoked Fish, PNW0450
Home Freezing of Seafood, PNW0586

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Pickling Fish and Other Aquatic Foods for Home Use

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Preserving seafood with acid, usually vinegar (acetic acid) or citrus juices (citric acid), is one of the earliest food-preservation techniques known. This is a common method of fish preservation in many parts of the world and is often an integral part of several ethnic cuisines. Fish preserved in this manner is often not thoroughly cooked (and may not be cooked at all), making these products potentially dangerous if not properly prepared. This pamphlet will provide some instructions on how to make these foods safely.

West coast and Pacific Northwest states have several species of fish that lend themselves well to pickling: shad, salmon, herring, shrimp, shellfish and sea vegetables are some examples. These marine products are relatively plentiful, little work is involved in their preservation, and the products are often delicious.

Fish with high oil content make the best pickled dishes. In addition to shad and herring, other common west coast species that work well are Chinook salmon, sturgeon, candle fish, anchovies, sardines, striped bass, and black cod (sablefish). Other species, such as cod, whiting, or ling cod, are also suitable, depending upon individual preferences. These different species may require slight modifications in preparation techniques, but following the basic steps outlined below will provide a good beginning to developing your own special recipe.

Safe and tasty fish-pickling recipes all have one thing in common—they use enough acid to prevent the growth of the food pathogen *Clostridium botulinum*. Although rare, botulism is a serious disease and an important concern in all food preservation processes. By following some simple rules, you can ensure that your favorite pickled fish is safe as well as delicious. This publication outlines the basic steps in pickling aquatic food products, offers some helpful hints on preparation, and provides a basic recipe that works well on most fish with high oil content.

The Basics—Salt Curing and Brining

Most good fish-pickling recipes call for salt curing prior to brining in an acidic pickling solution. This step removes some unwanted bacteria and slows the growth of others, reduces the water content, firms up the muscle protein for a good texture in the final product, and reduces the level of activity of some of the enzymes in the fish that can

cause the protein to break down during storage—a process that would reduce product quality.

Fish that is dried as well as salt-cured may be preserved without refrigeration and can be stored for extended periods before pickling. It is not common these days to make pickled products from salty dried fish, although this can be the starting material for some products, including those made from cod or shrimp. It is more common now to use dry salt or a brining solution to cure the fish under refrigeration (preferably at 38°F or lower). Fish is usually cured to 1.5–5% total salt, depending on the taste desired. After the fish is cured, it is placed in the pickling brine. It must be refrigerated and has a limited storage life (4 to 5 months).

In recipes that don't call for salt-cured fish, use only previously frozen fish (that was held at least 3 to 4 days in the average home freezer). This will ensure that no live parasites are present in the raw fish, which is particularly important for lightly-salted and marinated recipes.

Adding organic acids (vinegar, lemon, or lime juice) will limit the growth of most food pathogens and many of the bacteria responsible for food spoilage. The acid will also give flavor to the product, develop the desired texture, and soften bones. However, the acid will not preserve the fish indefinitely—it will only slow spoilage and softening caused by enzyme action. The concentration of acid (from the vinegar) must be high enough to prevent botulism by reducing the pH (a measure of acid strength) of the product to below 4.6. This pH is important so that bacteria called *Clostridium botulinum* will not grow in the product.

Growth of food-poisoning bacteria will be prevented when the starting pH is below 3.5. From a practical standpoint, this acid level is attained when the pickle solution contains one or more parts of 5 % vinegar to one part water.

The Recipe

Most pickling recipes contain vinegar, sugar, salt, spices, and onions, although many are much more simple. Items other than vinegar really do little to preserve the fish, but they can add to good flavor. The ingredients

of the pickling solution offered by this recipe are quite basic and can be modified to individual taste preference (Table 1). However, *never* use a solution with less vinegar than water.

If the flavor of the vinegar is too strong for your taste, change the type of vinegar used, or substitute lemon juice for part of the vinegar. Another trick is to add more sugar to offset the strong vinegar flavor (try doubling the amount of sugar to start.)

The Procedure

The following are basic steps in pickling fish. Not all fish can, or should, be treated exactly the same, but the steps are similar. This procedure salt cures the fish. If you skip the curing step, use only previously frozen fish.

Preparation

1. Remove the entrails, clean, and remove head and scales from whole fish.
2. Remove backbone in large fish by cutting lengthwise. This is not necessary on small fish such as herring.
3. Dry salt or brine cure 5 to 8 days. Salted fish may be stored in a cool place (preferably under 50°F) for 2 to 3 months before pickling (6 to 12 months under refrigeration).

Dry salting or “kedging”

Cover bottom of large pan with about 1/4 inch (0.5 to 1 cm) of fine Kosher salt, then place a layer of fish skin side down. Alternate layers of

Table 1. Recipe for a basic pickling solution (English and metric units).

Item	Amounts (to make about 1 gallon)	Amounts (to make about 2 liters)
Water	3 pints	750 ml
Vinegar (5% white)	4 pints	1000 ml
Sugar (granulated)*	2 cups	240 ml
Salt (table salt)	4 Tbsp	30 ml
Spice (mixed pickling spice)**	3/4 cup	110 ml
Onion (white, chopped, or rings)	two small	one small
Garlic (dry, chopped)***	1/4–1/2 tsp	2–4 ml

*For a sweet, Swedish-style pickle, add more sugar to taste.

**Use a spice blend that does not contain red peppers for a milder taste.

***Optional. One or two chopped fresh garlic cloves can replace the dry, chopped garlic.
NOTE: Increase all ingredients proportionally to make quantities greater than 1 gallon (2 liters) and always use more vinegar than water.