



TECHNICAL NOTE NO. 53 - UTILIZATION OF
SEA CUCUMBERS (Holothurians) AS FOOD

Sea cucumbers (sometimes called sea slugs) are fleshy echinoderms occurring commonly on the bottom both of intertidal and of deep-sea areas. They are related to starfish. The leathery skin, however, has no spines and no skeletal structure beyond small plates of calcareous material. The sea cucumber is a simple animal, tube-like in form, in which the skin and the longitudinal muscle surround the viscera. The front or anterior end is determined easily by the group of tentacles that serve to sweep water and food from the sea bottom.

In the North Pacific, sea cucumbers may be gathered at any time of the year, but natives in Alaska claim that the quality of sea cucumbers is poor during the summer or period of warmer water. Sea cucumbers, after being gathered, should be placed in a tub with a small amount of pure fresh sea water to allow them to contract. While they are still fresh and in good condition, they should be cleaned and eviscerated by cutting off one or both ends, splitting down the side, and scraping and flushing out the visceral matter. The skin and the attached inner muscle, which is usually white, can be handled in either of two ways:

1. Most people prefer to use only the white longitudinal muscle, which looks and tastes like excellent-quality sliced clam meats, once it is separated from the outer skin. The skin with attached muscle should be washed in fresh sea water, and the white muscle should be peeled or cut away from the skin as thin strips. The muscle then can be used fresh, frozen, or canned.

Fresh: Cook the thin white strips of muscle and use them in the same way as raw clam meats are used. The muscle, if simmered in a small amount of salted water for a few minutes, for example, can be minced easily and used to make chowder, fritters, and sea-cucumber dip, employing the same ingredients as those of clam dip--namely, fresh cream, cream cheese, and seasoning.

Frozen: Pack the muscle in small jars or cans, flood it with a 2-percent salt solution (about 1 tablespoon of salt per quart of water), close or seam it, freeze, and store at 0° F. The meats will keep for 3 or 4 months in good condition.

Canned: Use a process similar to that employed with minced razor clams. Fill the minced sea cucumber in brine into $\frac{1}{2}$ -pound cans (307 x 113) with c-enamel, vacuum-seam; process for 35 minutes at 240° F. (10 pounds steam pressure), and water cool. No data are available on the yield of meat per weight of whole animal, but it is known to be low.

2. The Indians of the Northwest Coast prepare the entire skin and attached muscle for use by boiling the eviscerated sea cucumber for about 20 minutes or by roasting it in a fire pit. The sea cucumber also can be dried and used in the same way as is trepang or dried sea cucumber of the Orient.

A discussion of the preparation of trepang is given in Research Report 18 of the Fish and Wildlife Service, U. S. Department of the Interior, Curing of Fishery Products, by Norman D. Jarvis. Copies of this bulletin may be bought from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 75 cents each.

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FIFTEEN MONTHS FROZEN STORAGE POSSIBLE FOR PINK SHRIMP

The frozen storage life of pink shrimp is between 9 and 15 months, depending on packaging materials and storage environment. This finding was the result of tests completed early this year at the U. S. Bureau of Commercial Fisheries Technological Laboratory in East Boston, Mass. It was found that (1) peeled and deveined and (2) headless pink shrimp in the shell, frozen individually and in block form, packed in commercial packages, and stored in a commercial-type cold-storage room at 0° to -5° F. became unmarketable in 9 months due to excessive dehydration. Storage of similar samples at the same temperature in a high-humidity jacketed cold-storage room extended the storage life by at least 3 months. The quality of the control-sample of shrimp which was vacuum-packed with water in hermetically-sealed cans and stored at -25° F. was still good to very good after 15 months of frozen storage.



INVESTIGATIONS IN FREEZING GULF OYSTERS

The problems involved in the freezing and storage of oysters have been investigated by Drs. E. A. Feiger, A. F. Novak, and M. E. Bailey at Louisiana State University. This research was conducted under a contract financed by the U. S. Bureau of Commercial Fisheries with funds provided by the Saltonstall-Kennedy Act of 1954. The contract was terminated in 1958. Numerous investigations were made in which various methods of pretreatment, packaging, and freezing techniques were studied in efforts to develop a procedure which would result in a satisfactory frozen product.

The most important requirement is that the oysters used for freezing be of prime quality, that is, have a high content of glycogen, fat, and total solids. It is also very important to maintain a good glaze on the frozen oysters throughout the storage period. Individually-frozen oysters or exposed surfaces of bulk-frozen oysters developed yellow colors and when these oysters were cooked the yellow color turned to orange and the oysters were found to have a strong, rancid flavor and odor.

In addition to the yellow discoloration as a result of frozen storage, the mantle fringe of the oysters turned black and the mantle tissues became transparent so that the viscera mass showed through as a black or greenish black spot. These changes occurred even though the oysters were well glazed and stored at 0° F. Some oysters also showed a pink discoloration near the adductor muscle.

The longer storage periods were also observed to result in increased fragility of the thawed oysters, and shrinkage and loss in weight during cooking also appeared to increase with increased frozen storage.

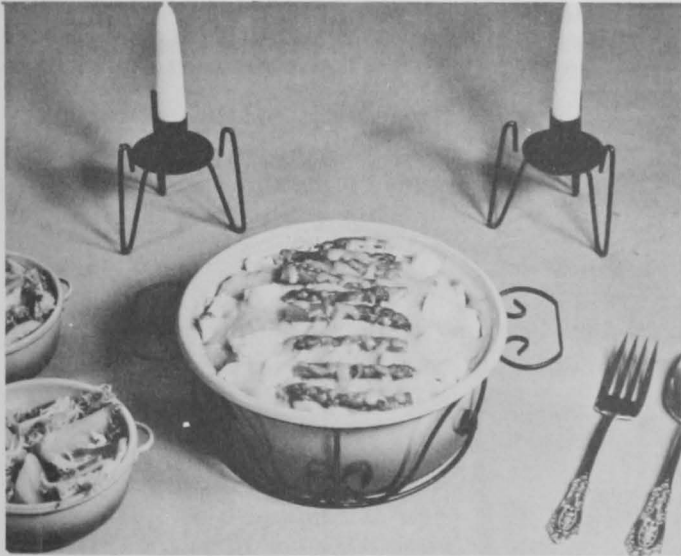
None of the treatments used on the raw oyster prior to freezing were successful in preventing all these adverse changes due to frozen storage. The use of a solution of sodium phosphate with a pH of 6.5 to 7.0 to wash the oysters prior to freezing reduced the amount of drip and the incidence of dark discoloration. Vacuum-packing in a sealed can was the best method of packaging tried.



HALIBUT IS PLENTIFUL

Halibut is now plentiful because this is the beginning of the halibut season in the cold waters of the North Pacific Ocean, off the coasts of Washington, British Columbia, and Alaska, reports the Fish and Wildlife Service of the Department of the Interior. The main fishing season lasts from 8 to 10 weeks.

The halibut, taken commercially, range in size from 5 to more than 80 pounds, with a few as large as 400 pounds being landed. The 5- to 10-pound sizes are referred to as "chicken halibut;" those from 10- to 60-pounds, "mediums;" those from 60- to 80-pounds, "large;" and those over 80 pounds, as "whale" halibut.



Halibut is a firm and flavorful fish having white, translucent meat. It may be prepared very successfully by any of the basic cooking methods such as frying, baking, broiling, and steaming.

Even though most of the halibut comes from the Pacific Northwest, halibut is available in all parts of the United States, mainly as frozen steaks. Chunks and fillets of

halibut are other forms in which it may be purchased. Frozen steaks or fillets may be cooked without thawing if additional cooking time is allowed.

The home economists of the United States Fish and Wildlife Service suggest that you take advantage of the abundance of halibut steaks and fillets on the market and serve "Curried Halibut Casserole" to your family this spring.

CURRIED HALIBUT CASSEROLE

2 CUPS FLAKED HALIBUT	$\frac{1}{2}$ CUP MILK
1 PACKAGE (8 OUNCES) NOODLES	1 CAN (10 $\frac{1}{2}$ OUNCES) CREAM OF MUSHROOM SOUP
1 $\frac{1}{2}$ TEASPOONS CURRY POWDER	1 CAN (1 POUND 4 OUNCES) ASPARAGUS, DRAINED
2 TABLESPOONS BUTTER OR OTHER FAT, MELTED	1 CUP GRATED CHEESE

Cook noodles as directed on package; drain. Place in a well-greased 2 $\frac{1}{2}$ -quart casserole. Cover with fish. Combine curry powder, butter, milk, and soup. Pour over fish and noodles. Arrange asparagus over casserole and sprinkle with cheese. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until brown. Serves 6.