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BIBLIOGRAPHY OF THE PRESERVATION OF FISHERY PRODUCTS BY FREEZING

Part II - Period of January 1945 to December 1947, inclusive

PART II

By John Dassow^{1/}

Abstracts for articles appearing in the literature for the period January 1945 to December 1947, inclusive. More recent literature in the field of frozen fish is covered in Commercial Fisheries Abstracts.

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^{1/} Chemist, Branch of Commercial Fisheries

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ADDITIONAL PERIODICAL ABBREVIATIONS NOT PREVIOUSLY LISTED

- C.F.R. Commercial Fisheries Review. U. S. Department of Interior, Fish and Wildlife Service, Washington 25, D. C.
- F.F. Food Freezing. Ogden Publishing Company, 55 West 42nd Street, New York, N. Y.
- F.P. Food Packer. Vance Publishing Corporation, 139 N. Clark St., Chicago 2, Ill.
- G.P. Good Packaging. 210 Mississippi St., San Francisco 10, Calif.
- J.F.R.B. Journal of Fisheries Research Board of Canada, Fisheries Research Board of Canada, Ottawa, Ontario, Can.
- M.P. Modern Packaging. Modern Packaging Corporation, 20th and Northampton Sts., Easton, Pa.
- P.P. Packaging Parade. Haywood Publishing Company, 360 N. Michigan Ave., Chicago, Ill.
- R.A. Refrigeration Abstracts. The American Society of Refrigerating Engineers, 40 W. 40th St., New York 18, N. Y.

General

756. New Methods of Freezing Fish and Shellfish Dishes. Anon. F.G. 62, No. 5, 78, 84, 1945.
The Maxson system is described in which a complete meal is precooked, packaged, and frozen.
757. The Preservation of Foods by Freezing. C. Birdseye. R.E. 51, No. 2, insert p. 176-7 Ref. Eng. App. Data 22, 1946.
A discussion of the methods of freezing, importance of proper handling before freezing, packaging, storage, and transportation.
758. Quick Freezing Technique. H. W. Dunsford. Inst. Refrigeration - Proceedings 42, 63-8, 1945-1946.
Discussion of quick freezing requirements such as quality control, packaging, transport, and distribution.
759. Quick-Freezing Technique. H. W. Dunsford. M.R. 48, No. 573, 283-4, 1945.
The technique covers quality control, packaging, quick freezing, storage, and transportation.
760. Problems in the Production of Precooked Frozen Foods. Barbara L. Hutchings and C. F. Evers. F.T. 1, No. 3, 421-426, 1947.
Denaturation of protein, retrogression of starch, and syneresis of gels or flour-liquid combinations are basic problems in precooked frozen foods.
761. Research and Quality Control in Precooked Frozen Foods. Barbara L. Hutchings and Clifford F. Evers. Canner, 102, No. 3, 13-14, 1946.
Problems for research include the use of various types of seasonings, correct cooking procedure, and development of standards.
762. Research and Quality Control of Precooked Frozen Foods. Barbara L. Hutchings and Clifford F. Evers. R.E. 51, No. 1, 26-29, 61, 1946.
763. Freezing Projects in Progress 1946 in U. S. and Canadian Laboratories. Jennie McIntosh. Frozen Food Foundation, Inc. Syracuse, N.Y., 23 pp., mimeographed.
764. Problems Concerning Frozen Foods. J. E. Nicholas and N. B. Guerrant. R.E. 50, No. 5, 417-419, 1945.
The problems of quality control, the function of the package, and storage temperatures for various foods are discussed.
765. Precooked Frozen Fish Preparations. Kathryn L. Osterhaug and Dorris L. Bucher. F.P. 26, No. 8, 42-44, 1945.
Recipes are given for seven precooked products which keep 5 to 8 months in frozen storage.
766. Frozen Food Bibliography. B. H. Weil and Frances Sterne. Spec. Rept. No. 23, State Engineering Experiment Sta., Georgia School of Technology, June 1946. Supplement Spec. Report #25 for Jan. 1946 to July 1947.
The first complete, indexed and expanded bibliography of literature pertinent to freezing.
767. Factors Influencing Quality of Frozen Meats. C. K. Wiesman. I.&R. 112, No. 4, 21-24, 1947.
Factors of quality include the type of meat, the initial quality, handling before freezing, packaging methods, freezing methods, and storage conditions.
768. Problems in Freezing Cooked Foods. J. G. Woodroff. Q.F.F. 8, No. 9, 90-91, 1946.
Care in cooking, prompt cooling, packaging in the absence of air, storing at 0° F. or lower, and rapid reheating in the package helps to preserve the flavor of the precooked product.
769. Freezing Preserves Many, but Not All, Cooked Foods. J. G. Woodroff and I. S. Atkinson. F.I. 17, No. 10, 105-106, 190, 1945; The Canner 101, No. 20, 24, 26, 1945; Ibid., 101, No. 21, 30, 32, 34, 42, 1945.
Satisfactory products may be prepared by freezing the precooked food in some cases when the canned and frozen raw product is unsatisfactory.

Development of Freezing

770. Refrigeration, Trend in the Pacific Fisheries. Anon. P.F. 43, No. 9, 45-55, 1945.
Outlooks for frozen fish markets, improved fish freezing methods, freezing fish at sea, refrigeration of fishing vessels, tuna freezing, etc. are discussed.
771. Postwar Refrigeration - Advances Seen in Postwar Frozen Fish and Seafoods. M. T. Zarotschenzeff. F.G., Annual Review, 62, No. 12, 210, 212, 214, 216, 1946.
A complete review of fish freezing and packaging for 1945-46.

772. Fishing Resources in Alaska Provide Means of Building Huge Frozen Fish Industry. M. T. Zarotschenzeff. I.&R. 112, No. 3, 19-22, 72, 1947.
A summary of a survey in 1946.

Theories on Freezing

773. Principles of Refrigeration. William H. Motz. Nickerson and Collins, 3rd Edition, Rev., illus., charts, tables, 664 pp., 1947.
A comprehensive treatise on fundamental principles.

774. The Complete Freezing of Fish. P. J. Frost and N. M. Carter. P.R.P.S. No. 62, 21, March, 1945.
Complete freezing does not occur close to 30° F. An appreciable amount of raw flounder flesh is still liquid at 0° F.

775. Drying and Freezing. M. Hirsch. R.E. 51, No. 4, 331-334, 1946.
The principles of drying and freezing are analyzed. Aspects common to both may be studied and make it possible to apply data from drying experiments to freezing problems and vice versa.

776. Refrigeration, Theory, and Applications. H. G. Venemann. Nickerson and Collins Co., Chicago, 1946, 2nd Edition, 336 p., illustrations, diagrams, charts, and tables.

Preparation for Freezing

777. New Fillet Cutting Machine. Anon. F.G. 62, No. 7, 43-44, July 1945.
Fillets from fish of 3/4 lb. to 4 lb. of different species are cut at the rate of 13,000 lbs. of fish per day with two operators.

778. Something Really New in Fish Fillets. Anon. F.I. 19, No. 8, 116, 1947.
A method for forming fish fillets into solid pieces of flesh 3/4" thick, 8" long, and 4" wide is described.

779. Evaluation of Surface pH as a Freshness Index for Fish Fillets. R. Paul Elliot. F.R. 12, 87-98, 1947.
Thawed, frozen fish did not show a dependable correlation between pH and freshness.

780. How to Control Quality of Frozen Cooked Foods. G. A. Fitzgerald. F.I. 19, No. 5, 113-115, 220, 221, 1947.
A quality control program includes raw materials, processing, plant sanitation, and distribution. E. coli and total bacteria count should be controlled.

781. Quality Control of Frozen Foods. Gerald A. Fitzgerald. F.T. 1, No. 4, 575-579, 1947.
A review.

782. Quality Grades are Essential for Frozen Food Packs. G. A. Fitzgerald. F.T. 18, No. 6, 108-110, 1946.
Quality can be maintained only if suitable standards are adopted for the raw and finished product.

783. Hydrocooling Combats Dehydration. W. E. Halin. R.E. 54, No. 5, 440-441, 1947.
Hydrocooling product with water at 33° F. before freezing reduces dehydration where the belt method of continuous freezing is used.

784. Essentials of Sanitation. N. H. Sanborn. F.G. 64, No. 7, 38, 70, 1947.
A complete discussion of points to check in making a sanitary survey.

785. Scientific Inspection of Quick Frozen Fish. G. J. Sigurdsson. Visindalegt eftirlit meth hrathfrystum fiski "Aegir (Reykjavik) Manadarrit," 38, No. 1, 12-15, 1945.
The formation and detection of changes in the carbohydrates by the acid content, in proteins by the tyrosine and amino nitrogen, and in fats by their rancidity is recommended for basis of a system of quality control in fresh and frozen fish.

786. New Method of Cutting Rockfish Fillets. M. E. Stansby and K. L. Osterhaug. Western Fisheries 34, No. 2, Ann. Rev., 38, May 1947.
Fillets can be cut by mechanical fish skimmer to produce thinner, more uniform size fillets of superior qualities.

787. Chemical Disinfection and Corrosion Prevention. H. L. A. Tarr. J. Fisheries Research Board Can. 7, 101-115, 1947.
A study of the effectiveness of solutions of disinfectants on bacteria in fish slime and on wooden surfaces.

788. Quality Control in the Frozen Foods Industry. D. K. Tressler. Proceedings, Inst. of Food Technologists, 146-153, 1945.
Strict freshness of raw material, proper sanitation, air tight packaging in moisture-vapor proof material, and low temperature storage are essential for high quality frozen fish production.

789. Fish Filleting Machine Cuts All Commercial Sizes. John V. Ziemba. F.I. 18, No. 10, 86, 1946.
Three types of fish filleting machines for cod, rosefish, and whiting are discussed.

Methods of Freezing

General

790. Quick Freezing of Fish in Germany. Anon. M.R. 49, No. 581, 212-215, 1946.
Four systems employed by the Germans were the multiplate freezer, the "Z" brine-fog process, the air blast system, and the contact system combined with air blast.
791. German Refrigeration—Food Research in Germany. British Teams Investigation, Institute of Refrigeration. R.E. 52, No. 3, 233-235, 1946; M.R. 49, No. 579, 145-148, 1946.
Description of the various types of quick freezers developed for commercial use during the war.
792. Sharp Freezing and Store's Rates. S. W. Dunkerley. M.R. 49, No. 574, 15-16, 1946.
Sharp freezing requires four times the evaporator surface of ordinary freezing, requires additional insulation, and necessitates larger compressors for equivalent capacity at low temperatures.
793. Methods of Improving Food Freezing Operations. Wm. J. Finnegan. I.&R. 112, No. 2, 53-56, 1947.
The development of the multi-stage freezer and its advantages.
794. Dehydrofreezing—New Way of Preserving Food. L. B. Howard and H. Campbell. F.I. 18, No. 5, 88-90, 1946.
Experiments with fruits and vegetables have shown that removal of about two-thirds of the water content, followed by freezing at -30° F. and storage at -10° F. resulted in fresh quality product retention in most cases.
795. More Research in Methods of Quick Freezing Seafoods. J. M. Lebeaux. Southern Fisherman 6, No. 5, 32, 1946.
By using a flash freezing process, the time for properly freezing shrimp has been reduced to 6 minutes.
796. Flash Freezing of Foods. C. L. Mazzola. F.I. 18, No. 12, 73-77, 210, 1946.
Foods are frozen by flash evaporation in a high vacuum producing a product with 75% of the original moisture.
797. Evaluating Food Freezing Methods. George W. Meek and Van Rensselaer H. Green, Jr. R.E. 52, No. 5, 391-395, 454, 1947; F.I. 19, No. 9, 92-97, 206, 1947.
Classification and discussion of various freezing methods, including air blast, immersion, and contact freezers.
798. An Evaluation of Food Freezing Methods. G. W. Meek and Van R. H. Green, Jr. F.F. 2, No. 7, 471-475, 1947.
Versatility, material handling costs, speed of freezing, initial cost, defrosting requirements, operating costs, and space requirements are factors in evaluating a freezing system.

799. Quick Freezing Performance of an Experimental Sub-zero Food Freezer. J. E. Nicholas. The Canner 101, No. 10, 15-16, 1945.
Freezing without wrapping decreases by $4\frac{1}{2}$ times the time interval to freeze.

Comparison of Methods

800. Quick Freezing Plants and Their Operation. C. W. Hulse. I.&R. 112, No. 5, 43-47, 1947.
The advantages and disadvantages of the blast, tray truck, continuous, and shaker freezers are discussed.

Blast Freezing

801. Method of Freezing Fish and Similar Goods. Anon. Svenska Turbinfabriks Aktiebolaget Ljungström, Dan 65, 943, 1947; R.A. 3, No. 2, 174, 1948.
Description of a new machine for freezing fish by air blast and shaker method.
802. Mass Freezing of Packaged Meat. F. W. McKenna. N.P. 112, No. 14, 18-19, 41, 1945.
Small investment and versatility are advantages of blast freezing on shelf trucks.
803. The Psychrometry of Air Blast Food Freezing Systems. G. W. Meek. R.E. 53, No. 4, 309-310, 1947.
Single stage and multi-stage blast freezers are discussed.
804. A Vertical Conveyor Freezing Unit. Van Rensselaer H. Green. Q.F.F. 7, No. 6, 40, 1945.
The unit consists of a vertical conveyor in which a series of standard size food trays are carried through a spray type circulating air freezer.

Indirect Contact Freezing

805. The Jackstone Froster. Anon. M.R. 49, No. 583, 273, 1946.
A description of a new multi-plate, double contact type freezer, completely self-contained and transportable.
806. The Linde Karussell Freezer. Anon. M.R. 49, No. 581, 203, 1946.
Commodities are frozen in packages slightly compressed between ribbed plates which are cooled by an air blast.
807. New Gravity Froster. C. Birdseye. M.R. 50, No. 589, 108, 1947; Q.F.F. 9, No. 8, 165, 1947.
The loose product enters the cabinet-type freezer at the top and flows downward and along a series of stainless steel freezing plates until it immerses hard frozen at the bottom.

Direct Contact Freezing

808. Tuna Brine Chilling and Freezing. Anon. P.F. 43, No. 9, 58-59, 1945.
The process of chilling and freezing tuna with refrigerated brines is described.

Methods Used for Individual Species

809. "Hamilton Foods" Vacuum Freezes Shrimp. Anon. Q.F.F. 10, No. 3, 77, 1947.
Cooked, peeled shrimp are frozen successfully by a new vacuum process.
810. Herring Quick Freezing. Anon. M.R. 48, No. 568, 155-158, 1945.
Food Manufacture 20, No. 9, 330-333, 1945.
Herring are weighed into 7 lb. lots and quick-frozen in metal trays at -25° F. in a tunnel freezer.
811. Oysters. Anon. P.F. 43, No. 2, 275-277, 1945.
Air-blast freezing of oysters in cans is satisfactory if temperature is sufficiently low for rapid freezing.
812. Processing Fillets--Practical Freezing Techniques. Anon. Q.F.F. 9, No. 8, Insert p. 146, pp. XV-XVI, 1947.
Description of preparation of haddock fillets and shrimp for freezing.
813. Quick Frozen Whale Meat. Anon. M.R. 49, No. 579, 133, 1946.
Whale meat is cut into 50 lb. slabs, placed in freezing molds, and frozen by means of circulating brine at -23° C.
814. Shrimp Quick Frozen on Mexican Trawler. Anon. P.F. 43, No. 12, 86, 1945.
Shrimp are cleaned, headed, placed into 5 lb. stainless steel pans, and frozen aboard ship.
815. Succulent Shrimp via Quick Freezing. Anon. Food Packer 28, No. 11, 34-35, October 1947.
Mexican shrimp are frozen in 5 lb. metal pans and the blocks packaged in waxed cardboard cartons for shipment.
816. The Future of Herring Freezing. F. A. Bell, et al. Herring Ind. Board, 11th Annual Rept. 1946, from Refrigeration Abs. 2, No. 4, Oct. 1947.
Pilot plant quick freezing of herring by air blast, by multiple freezer, and with brine have proved the commercial practicability of these processes.

817. Cold Treatment of Herrings. A. Banks. Food 14, 151-155, June 1945.
Salt activates the development of rancidity in herring. A thick ice glass is better protection against oxidation than a moisture-vaporproof wrapper. Storage at -22° F. was satisfactory; storage at -4° F. was not.
818. Freezing and Storing Herring. A. Banks. M.R. 48, No. 565, 83-85, 1945.
Air frozen herring stored at -22° F. were superior to herring frozen in brine or stored at -4° F.
819. Refrigeration Rescues Shrimp Packing Industry. C. W. DuBois. I.&R. 108, No. 4, 62, 1945.
A new floating shrimp plant freezes shrimp in 5 lb. boxes.
820. Conditions Affecting Quality of Frozen Shrimp. E. A. Fieger and C. W. DuBois. R.E. 52, No. 3, 225-228, 1946.
Shrimp should be cleaned and frozen immediately after being caught in order to produce a high quality product.
821. Shrimp Deveined and Frozen. C. R. Havighorst. FI. 17, No. 11, 102-103, 1945.
Headless shrimp are automatically deveined by means of a saw and a high pressure spray. Shrimp are graded, shelled, and frozen in 5 lb. pans.
822. The Freezing of Swordfish. Antonio Lopez-Matas and C. R. Fellers. Q.F.F. 10, No. 3, 72-74, 103, 1947.
Freezing time, rates, packaging methods and effect on storage life are discussed.

Aboard Ship

823. Deep Sea--A Pioneering Venture. King Crab Fishing, Processing, and Freezing Aboard Ship in Sub-arctic Waters. Anon. P.F. 45, No. 7, 36, 1947.
824. Fillet Freezing at Sea. Anon. P.F. 43, No. 10, 81, 1945.
A new 70' trawl and tuna boat is provided with both brine and sharp freezers for freezing either tuna or fillets.
825. Floating Freezer. Anon. F.P. 27, No. 8, 42, 1947.
The 140 ft. trawler, Deep Sea, is equipped to process, freeze, and package king crabmeat.
826. Partially-Insulated Carriers. Anon. M.R. 47, No. 561, 293-295, 1945.
Cross section plans are presented as a guide to the process of insulating cargo liners.

827. Refrigerated Factory Ship Processes and Packages Seafoods. Anon. R.E. 54, No. 2, 127, 178, 1947. A description of the 140 ft. trawler, Deep Sea, including the refrigeration.
828. Refrigerated Fishing Boat Launches New Fish and Shrimp Industry. Anon. I.&R. 113, No. 5, 21, 1947. A new steel shrimp boat is equipped for blast freezing and packaging shrimp.
829. Refrigeration of Fishing Vessels. Anon. Western Fisheries 33, No. 1, 48-49, October 1946. Description of requirements for mechanical refrigeration of fishing vessels.
830. Today's New Trend in Tuna Operations. Anon. P.F. 45, No. 11, 50-57, 1947. Tuna is frozen aboard large motherships for transport to the canneries.
831. Freezing Shrimp Aboard Trawler. J. A. Pullen. I.&R. 108, No. 1, 59, 1945. A new polyphase immersion freezer is described for freezing shrimp and shellfish at sea.
832. Future of Fish Industry. Dr. G. A. Reay. M.R. 50, No. 590, 138, 1947. Future of industry lies in providing fresh fish to consumer by using floating freezing ships with smaller fishing vessels.
- Packaging
833. Packaging Foods for Freezing. Joan Adams (Karen Fladoes). Better Food 52, No. 9, 42-47, 1947. Requirements for frozen food packages and films are discussed.
834. New Plastic Films, Their Packaging Qualities. W. H. Aiken. M.P. 19, No. 9, 141-144, 1946. Desirable properties for films and characteristics of plastic films are discussed.
835. Water Vapor Permeability. W. H. Aiken, P. M. Doty, and H. Mark. M.P. 18, No. 12, 137-140, 166, 1945. Mechanism of water vapor penetration through molecular films of water vapor barrier compounds is discussed.
836. WVP of Packages. American Society for Testing Materials. M.P. 20, No. 12, 129, 170, 1947. The tentative method for testing water-vapor permeability of shelf packages is described.
837. Fish Bricks. Anon. M.P. 20, No. 12, 100-101, 178, 1947. A new 1-lb. package of frozen pressed fillet fish is described.
838. Foil for Freezers, a Single Unit Container. Anon. M.P. 19, No. 8, 101-102, 1946. A new package is made from a single sheet of heavy aluminum foil by crimp-folding the sides and ends.
839. Laminants and Coatings for Papers, Plastic Films, and Metal Foils. Anon. P.P. 13, No. 149, 52-55, 1945. Specifications for packaging films are presented and discussed.
840. Mechanical Packaging of Frozen Foods is Successful. Anon. G.P. 6, No. 10, 16-17, 34, 1945. Packers demonstrate the efficiency of a new automatic filler for flowing varieties of frozen food.
841. New Frozen Fish Package. Anon. F.G. 64, No. 7, 31, 56, 1947. A new one-pound package of frozen filleted cod or haddock, produced in a solid block, has been developed.
842. Wax Coating Frozen Foods. Anon. F.I. 19, No. 4, 77, 204, 1947. A new method of dip coating frozen foods in a thermoplastic wax is described.
843. What's New in Fish Packaging. Anon. F.G. 64, No. 5, 48-50, 82, 1947.
844. Determination of Moisture-Vapor Transmission of Packaging Materials. L. Boor and J. K. Dixon. Paper Trade J. 119, 176-184, November 1944; Analyst 70, No. 828, 103, 1945. Moisture-vapor transmission is measured by calibrated instrument which measures the thermal conductivity of the gas.
845. Aluminum Foil for Frozen Food Packaging. G. F. Chase and G. H. Sullivan. G.P. 6, No. 8, 12-13, 1945. The use of aluminum foil increased the rate of freezing by 20% compared to cellophane during air blast freezing.
846. Flavor Retention with Organic Packaging Materials. E. C. Crocker. M.P. 19, No. 4, 147-150, 1945. Packaging materials have inherent characteristics which make them especially suitable for packaging certain foods.
847. Gas Permeability, an Isostatic Test Method. Donald W. Davis. M.P. 19, No. 9, 145-149, 176, 1946. A discussion of the isostatic method for determining permeability of CO₂, O₂, and N₂.

848. Future of Frozen Food Depends on Packaging. Albin P. Dearing. F.I. 18, No. 8, 100-101, 216, 1946.
The packaging industries should establish proper packaging specifications in cooperation with the food technologist.
849. Ethyl Cellulose Sheeting--Its Properties and Fabrication. F. C. Dulmage and F. J. MacRae. M.P. 18, No. 11, 142-145, 1945.
850. Method for Locating Points of Gas Leakage in Packages and Packaging Materials. H. H. Hartwig. G.P. 8, No. 6, 27-28, 1947.
851. Wrapping Materials for Frozen Fish. Martin Heerdt, Jr. C.F.R. 8, No. 9, 6, 1946.
Tests demonstrated the inadequacy of ordinary moisture-vaporproof films in keeping air away from frozen fish fillets wrapped according to present practice.
852. Aluminum--Its Future in Frozen Foods. T. M. Hill. Q.F.F. 8, No. 11, 86-88, 1946.
A discussion of specific properties of aluminum foil for frozen food packaging.
853. Cellophanes--They Look Alike but There Are "57" Varieties. W. G. Hunter. M.P. 19, No. 10, 110-111, 1946.
A description of manufacturers' codes and specifications is given.
854. Iceless Pack for Seafood. Dr. Spencer A. Larsen. M.P. 19, No. 4, 104-107, 1945.
An insulated package has been developed for shipping frozen fish by air.
855. Packaging III. Effect of Mould Growth and Aging on the Water Vapor Transmission of Packaging Materials. C. G. Lavers and W. I. Illman. C.J.R. 24, Sec. F, No. 2, 117-122, 1946.
856. Packaging IV. Methods of Applying Water Vapor Barriers and the Water Vapor Resistance of Some Packaging Materials. C. G. Lavers and J. A. Pearce. C.J.R. 24, Sec. F, No. 6, 409-419, 1946.
857. Aluminum Foil--Its Future as a Packaging Material for Frozen Food. W. L. McCaque. G.P. 7, No. 10, 11-13, 1946.
Ground meat was wrapped in laminated foil and wax paper wraps, frozen, and stored for comparison.
858. Study of Frozen Food Wrapping Materials. D. C. McCoy, S. U. Cook, and G. A. Hayner. R.E. 52, No. 6, 531-534, 1946.
The characteristics of locker-type papers, laminated papers, foil, cellophane, and others are compared.
859. Food Packaging Studies 4. Significance of WVTR in Protecting Frozen Meat. D. Metcalf, W. P. Van Eseltine, and G. J. Hucker. M.P. 20, No. 1, 147-149, 1946.
There is a direct relation between temperature and the water vapor transmission rate of the protecting wrap.
860. The Kinetics of Package Life II. The Temperature Factor. C. R. Oswin. J.S.C.I. 64, No. 8, 224-225, 1945.
The resistance to aqueous penetration of regenerated cellulose films varies approximately as the inverse square of the saturation vapor pressure of water at the temperature of measurement.
861. Standard Test Methods
1. For water-vapor permeability at 0° F.
2. For water-vapor permeability at 100° F.
3. For heat-sealing strengths and characteristics.
4. Gas permeability of low-permeability films
Packaging Institute. M.P. 19, No. 11, 140-142, 1946;
No. 12, 146-147, 164, 1946; 20, No. 1, 150-151, 180, 1946;
No. 2, 151-152, 178, 1946.
862. Low Temperature WVT. S. W. Pierce and J. F. Helms. M.P. 20, No. 8, 161-164, April 1947.
A new method of testing the water vapor transmission of frozen food containers is described.
863. How Processors Can Test and Improve Their Own Packages. A. L. Pitman. F.I. 18, No. 7, 104-106, 1946.
The conditions under which packages are handled should be studied. Palatability tests and experimental packs are important.
864. Films for Produce--Their Physical Characteristics and Requirements. Hans Platenius. M.P. 20, No. 2, 139-143, 170, 1946.
Gas permeability and water vapor transmission thru transparent films are discussed.
865. Testing Packaging Materials for Quick-frozen Oysters. S. R. Pottinger, Rose G. Kerr, and Wm. B. Lanham, Jr. F.I. 19, No. 3, 324-326, 444, 446, 1947.
All containers affording good moisture-vapor retention proved satisfactory for storing frozen oysters.
866. Impact--Effect on Moisture Barriers at Low Temperatures. William Rabak and J. B. Stark. M.P. 18, No. 8, 137-139, 166, 1945.

867. Sealing Temperature and WVP, a Correlation in Effectiveness of Waxed Papers. W. Rabak and J. B. Stark. M.P. 19, No. 8, 157-160, 1946.
The heat-sealing operation definitely impairs the water vapor resistances of waxed papers.
868. Sealing Temperatures—Effect on Water Vapor Permeability of Waxed Papers. William Rabak and J. B. Stark. G.P. 7, No. 3, 28-29, 43, 1946.
The heating-sealing operation impairs the water vapor resistance of waxed papers.
869. What is the Protective Value of the Double Overwrap? W. Rabak and J. B. Stark. F.I. 18, No. 11, 82-83, 220, 1946.
Tests demonstrated that the double overwrap markedly increases the barrier effect.
870. Packaging Research. Its Application to the Food Industries. G. L. Riddell. Food 15, 32-34, 1946.
The various factors influencing the keeping quality of foods packed in paper, board, film, or metal foil are discussed.
871. Simplified WVP Test of Papers and Films. A. W. Schwab, L. B. Falkenburg, and J. C. Cowan. M.P. 18, No. 12, 141-143, 1945.
872. Electronic Heat in the Food Industries. V. W. Sherman. F.I. 18, No. 4, 90-93, 212, 1946.
Frozen products are defrosted rapidly with a minimum of bacterial growth by dielectric heating.
873. The Job of Packaging Frozen Foods. Lee Turley. Q.F.F. 7, No. 10, 48-49, 1945.
Steps in wrapping steak, fowl, ground meat, fish, and small game are described.
874. Packaging II. A Cellulose-Base Container for Modified Vacuum Packing. A. H. Woodcock. C.J.R. 23, 117-122, 1945.
Packages made from wax-coated laminated cellophane and gas-packed with CO₂ produce a vacuum pack on standing.
875. Packaging I. Water-Vapor Resistance of Cellulose-Base Containers. A. H. Woodcock, M. G. Chapman, and J. A. Pearce. C.J.R. 23, Sec. F, 109-116, 1945.
Lacquers and resins coated on paper stocks were less effective water-vapor barriers than waxes.
876. Cost vs. Convenience in Packaging. Leo Young. Q.F.F. 2, No. 12, 74, 1947.
The increased cost between catch-weight packages of frozen fish and even-weight packages is five cents a pound at the processing level.

877. How a Food Packaging Laboratory Functions. John V. Ziemba. F.I. 19, No. 9, 86-89, 1947.
The importance of testing the frozen food package is discussed.
878. Proper Packaging Protects Frozen Meats. J. V. Ziemba. F.I. 18, No. 11, 102-104, 1946.
Proper packaging for frozen foods is necessary for maintaining product quality during freezing, storage, and marketing.

Effect of Freezing

General

879. The Role of Water in Freezing Foods. Milo R. Daughters and Lawrence S. Glenn. R.E. 52, No. 2, 137-140, 1946.
The form of water in various foods and its influence on quality in frozen foods is discussed.
880. Freezing Rate, Meat. Aage Jepsen. R.E. 51, No. 4, 357, 376, 378, 1946.
Microphotographic cross sections of beef are of interest in relation to the effects of fast freezing.
881. Influence of Freezing on Color of Bones and Adjacent Tissues. C. H. Koonz and J. M. Ramsbottom. F.R. 12, 393-399, 1947.
Hemoglobin was oxidized to meth-hemoglobin when bones containing red marrow were frozen and defrosted.

On Organisms

882. Influence of Freezing on the Activity of Enzymes. Friedrich Kiermeier. Biochem Z. 318, 275-296, 1947; C.A. 42, 3008, 1948.
The enzymes catalase and lipase retain their activity to a higher degree in frozen substrates than in undercooled fluid condition.

Changes in Storage

General

883. Luminescence Analysis for Determination of Quality of Fresh or Cooked Fish. A. A. Adamova and S. E. Spektor. Gigiena i Sanit. 12, No. 4, 41-44, 1947; C.A. 42, No. 4, 1361, 1948.
Spoilage of frozen fish may be detected by luminescence under ultraviolet light.

Effect of Temperature on Changes

884. Can Fish Be Stored in Same Locker with Other Foods? M. Heerdt. Western Canner and Packer 38, No. 9, 54, 1946. Tests with frozen fish in locker with butter showed that no odors are absorbed by butter if fish is properly packaged.

891. Studies on the Storage of Herring in Refrigerated Brine. G. J. Sigurdsson. Proceedings, Inst. of Food Technologists, 91-114, 1945. Temperatures lower than 32° F. are desirable for storage of herring for canning.

885. Histological Characteristics, Tenderness, and Drip Losses of Beef in Relation to Temperature of Freezing. R. L. Hiner, L. L. Madsen, and O. G. Hawkins. F.R. 10, 312-324, 1945. Beef frozen at lower temperatures has greater fibre damage but is more tender and has a smaller amount of drip.

Desiccation in Storage

886. Reduction of Spatial Temperature Variations in Air-cooled Storage Rooms I and II. J. W. Hopkins, T. A. Steeves, and W. H. Cook. C.J.R. 23F, No. 4, 253-262, 1945; 24F, No. 5, 380-395, 1946. The temperature gradients in material stacked in air-cooled storage rooms may be reduced by effective circulation of air and blocking of voids in the room.

892. Toughening of Frozen Crabmeat Can Be Retarded. Martin Heerdt, Jr. D.F.R. 9, No. 2, 7-10, 1947. Toughening of frozen crabmeat can be retarded by partial-vacuum packaging or by addition of 3 percent brine to the meat.

887. Drip as a Constant for Quality Control of Frozen Foods. Socrates A. Kaloyereas. F.R. 12, 419-428, 1947. A method for determining drip of frozen products is described with petroleum ether saturated with water as the thawing medium.

Effect of Storage on Organisms

893. Refrigeration in Food Control Program. H. S. Adams. Am. J. Pub. Health 36, 9, 1007-1011, Sept. 1946. Function of refrigeration in arresting metabolism, bacterial growth, and enzymatic action are discussed. Bibliography.

888. BAI Research on Tenderness, Freezing, Storage at 0° F. A. W. Miller. Ann. Rept. of Bureau of Animal Industry, June 30, 1945; N.P. 114, No. 10, 17, 1946. Pork loins vacuum packed in tin cans remained practically constant in flavor throughout a 36-week storage at 0° F.

894. Control of Micro-organisms in Food Storage Rooms. W. L. Mallmann and E. S. Churchill. R.E. 51, No. 6, 523-528, 1946. Ultra-violet light and ozone are good for air decontamination. Hypochlorites and quaternary ammonium compounds may be used for surface sterilization.

889. Studies on Deterioration of Vitamin A in Fish Livers and Liver Oils. I. Loss of Vitamin A and Stability in gray fish livers in storage. F. B. Sanford, D. Miyauchi, and G. I. Jones. C.F.R. 2, No. 2, 11-15, 1947. II. Loss of Vitamin A potency and stability in frozen ground livers. D. Miyauchi and F. B. Sanford. Ibid. No. 5, 7-9. Ground gray fish livers held for as long as 41 weeks in frozen storage at -22.5° C. lost no appreciable amount of Vitamin A.

895. Microbiological Aspects of Frozen Precooked Foods. B. E. Proctor and A. W. Phillips. Western Canner and Packer 39, 84-85, March 1947. Many precooked frozen foods, on thawing, furnish excellent substrates for growth of micro-organisms.

Development of Rancidity

890. Nutritive Value of Frozen Foods. Donald K. Tressler. J. Am. Dietetic Assoc. 21, 273-276, 1945. A review of nutritive value of most frozen foods with regard to minerals, carbohydrates, fats, and proteins.

896. Changes in Fats and Oils During Freezing and Thawing. Anon. F.I. 19, No. 5, 122-123, 1947.

897. Controlling Rancidity in Frozen Sausage Meat. T. Atkinson, S. R. Cecil, J. G. Woodroof, and E. Shelor. F.I. 19, No. 10, 102-105, 1947. Storage life of frozen sausage varied from 2 to 24 months depending on type of package, seasoning, storage temperature, and addition of anti-oxidants.

898. **Extend Keeping Quality of Frozen Pork Sausage.** Ida Atkinson, S. R. Cecil, J. G. Woodroof, and Ethyl Shelor. F.I. 19, No. 9, 78-81, 1947. Rancidity was retarded by smoking and by using pepper. Salt and curing accelerated rancidity.
899. **Antioxidants for Fish Oils,** Dorris Bucher. Fishery Market News 7, No. 7, 17-19, 1945. N.D.G.A. or hydroquinone were about equally effective in protecting fish oils against oxidation.
900. **Chemical Agents Give Quality Improvements in Fisheries.** Cecil G. Dunn. Food Technology 1, 371-383, 1947. A review of the role of antioxidants, detergents, and germicidal ices in retarding the deterioration of fishery products.
901. **Quality of Frozen Stored Beef.** D. C. McCoy, G. A. Hayner, R. Hockman, and W. Reiman. I.&R. 111, No. 5, 55, 1946. Development of off-flavors is due principally to oxidation of fatty tissues and the surface of the beef itself.
902. **Toxicity of Rancid Fats.** F. W. Quackenbush. Oil and Soap 22, No. 12, 336-337, 1945. Experimental evidence indicates that rancid fats are able to exert a toxic effect in the diet.
903. **How to Retard Rancidity in Salt-cured Fish.** R. E. Silver. F.I. 17, No. 12, 84-86, 1945. The fat of salt-cured herring was stabilized by coating the fish with an edible oil containing antioxidant. The treatment is applicable to frozen fish.
904. **Control of Rancidity in Fish Flesh. I. Chemical Antioxidants.** H.L.A. Tarr. J.F.R.B. 7, No. 3, 137-154, 1947. The development of rancidity in the fats of frozen fish was retarded by treatment with ascorbic acid and gallate compounds.
905. **Control of Rancidity in Stored Fish I.** H. L. A. Tarr. P.R.P.S. No. 64, 57-61, 1945. Ethyl gallate, propyl gallate, and ascorbic acid retarded the development of rancidity in salmon and herring flesh.
906. **Control of Rancidity in Stored Fish II.** H. L. A. Tarr. P.R.P.S. No. 66, 17-20, 1946. The development of rancidity in frozen fish was retarded by storage in a vacuum or in an inert gas.
907. **Control of Rancidity in Stored Fish III.** H. L. A. Tarr. P.R.P.S. No. 68, 52, 1946. Tests indicated that .04% ascorbic acid must be present in fish flesh in order that fat oxidation be retarded significantly.
908. **How to Prevent Rancidity in Frozen Pork Sausage.** C. K. Wiesman and John V. Ziemba. F.I. 18, 1863-1864, 1982, 1984, 1946. Lean meat discoloration and rancidification of pork fat in frozen pork sausage were prevented over a 6 month storage period by excluding salt from the formula.

Transportation

909. **Cleaning. Useful Techniques for Refrigerator Cars.** Anon. N.P. 115, No. 21, 18-19, 1946. Methods for cleaning and fumigation are discussed.
910. **Dry Ice Car Tested.** Anon. Q.F.F. 2, No. 11, 79-80, 1947. Dry ice is used as a primary refrigerant to cool a secondary refrigerant, which is circulated through coils in the car.
911. **Fresh Frozen Shrimp over Desert Roads.** Anon. F.I. 18, No. 10, 107-108, 1946. A mechanically refrigerated truck and trailer units used to transport frozen shrimp from Calif. to Arizona.
912. **Mechanical Refrigerator Car Announced—Tests Conducted by U. S. Dept. of Agriculture.** Anon. I.&R. 113, No. 1, 21-23, 72, 1947. A refrigerator car equipped with split-absorption system maintained 0° F. temperature under conditions of summer heat.
913. **New Dry Ice Freezer Railroad Car.** Anon. F.F. 2, No. 7, 484, 1947. Dry ice is used as a primary refrigerant in a single end bunker refrigerator car. Approximately 800 lbs. of dry ice per 24 hours was used on a trial trip.
914. **Transportation Developments. Split-absorption system Refrigerated Car.** Anon. Q.F.F. 2, No. 11, 78-79, 1947; F.I. 19, No. 7, 80-82, 1947. Lower commodity temperatures of -4° to 43° F. may be maintained with outside temperatures as high as 90° F.
915. **Transportation of Fishery Products.** Anon. F.G. 62, No. 12, Ann. Rev. 228-234, 1945. Air transport and new types of refrigerated trucks are being used.

916. Refrigerating System for Mobile Vehicles. Alfred Morgan Biehl. U. S. 2, 374, 972. N.P. 112, No. 24, 30, 1945.
The system incorporates a vaporizing expansion cooling coil, a storage pressure tank, absorption tank, and thermostatically controlled circuits.

917. Air Cargo Problems. The Carrier's Viewpoint. Emery F. Johnson. N.P. 12, No. 8, 120-124, April 1946.
The plane offers rapid transit of goods but restrictions on weight and size of packages are a problem.

918. Air Cargo Research and the Marketing of Fishery Products. Dr. Spencer A. Larsen. Natl. Fisheries Inst., Yearbook, p. 27, 1946.
New lightweight containers, mechanical refrigeration, and cargo planes are being developed.

919. The Transportation of Frozen Foods. K. V. Plummer. Q.F.F. 2, No. 11, 81-82, 1947.
Relative merits of types of refrigerator cars are discussed. The ice and salt method is still the most economical and practical.

920. Refrigerator Car and Method of Using. Beverly E. Williams. U. S. 2, 381, 796; N.P. 113, No. 11, 36, 1945.
An improved procedure for refrigerating cars by means of sealed channels for low temperature fluid.

921. Refrigerator Car Tests IV. O. C. Young. P.R.P.S., No. 62, 17, March 1945.
Eutectic mixtures of salt and ice were used to refrigerate an experimental roof tank car.

Economics

922. Expanding Market for Frozen Fish Fillets. Anon. C.F. 33, No. 6, 11, 1946.
The fresh and frozen trade should encourage more domestic consumption. Filleting and freezing should be used only for highest quality fish.

923. Fish and Seafood, Their Future as Quick Frozen Products. Anon. Q.F.F. 8, No. 6, 60-63, 94, 1946.
Greatest opportunity for increased fish sales lies in frozen fillets but products must be fresh.

924. The Freezing and Cold Storage of Fish and Seafoods. Gerald A. Fitzgerald. F.G. 63, No. 12, 200-208, Ann. Rev., 1946.
A review of past and present methods and the need for improved merchandising procedures.

Thawing and Cooking

925. New Defroster Developed. Anon. Q.F.F. 8, No. 10, 36-37, 1945.
A new dielectric heater is described which defrosts frozen food in a few minutes.

926. Dielectric Heater for Defrosting Frozen Foods. Anon. N.P. 114, No. 10, 21, Mar. 9, 1946.
A new 2 kw. dielectric heater operates on a frequency of 27 megacycles and may be used for quick defrosting.

927. Defrosting Frozen Foods by High-Frequency Heat. W. H. Cathcart, W. H. and J. J. Parker. F.R. 11, No. 4, 341-343, 1946.
Frozen fish in one lb. cellophane wraps was defrosted in 10 minutes to 50° F. by using high-frequency heating.

928. Recent Trends in Frozen Foods. Edith H. Nason. Jour. American Dietetic Assoc., 23, No. 4, 318-321, 1947.
Differences in thawing methods made little or no differences in the texture of meat after cooking.

929. An Improved Method of Reheating Cooked Frozen Foods. K. M. Singer. Q.F.F. 8, No. 9, 84-85, 128, 1946.
Foods are packed in individual portions in double parchment bags and defrosted and heated by placing in boiling water.

Commercial Operations

930. Mechanized Handling of Frozen Foods. Anon. Q.F.F. 2, No. 10, 58-60, 1947.
The problem of materials handling in the frozen food field can be simplified by efficient storage and use of palletized loading with lift trucks.

931. Packaging One Pound Fillets at Gloucester. Anon. Q.F.F. 10, No. 2, Insert p. 66, 2 pages, 1947.
Description and pictures of a Gloucester fillet freezing plant.

932. How We Pack Frozen Fish. H. Synnestvedt. The Food Packer 26, No. 2, 26-27, 1945.
Filleting, packaging, and freezing operations on ground fish are described.

933. The Frozen Foods Industry to Date. E. W. Williams. Q.F.F. 7, No. 7, insert pp. I-IV, 1945.
Background history of the industry, production growth figures, and future potentialities are discussed.

934. Freezing Marine Products in Texas. W. R. Woolrich, Jr.
R.E. 54, No. 3, 222-225, 1947.
Texas lacks adequate and properly located refrigeration facilities for full development of the fish industry.

Home Freezers and Lockers

935. Home Food Freezers. R. H. Bishop. R.E. 53, No. 1, insert p. 65, 12 pp., Application Data Section 37, 1947.
Data on the design and construction of home freezers.
936. Freezing Rates of Foods. John E. Nicholas. Penn. State College, Agriculture Experiment Station, Bull. 471, February 1945.
Rates of freezing were studied in farm and home-type freezers and in locker plants with single-plate and air blast freezers.
937. Home Freezers—Present and Future. Part I and II. Donald K. Tressler. R.E. 49, No. 2, 97-102, 120, 1945; 49, No. 3, 194-197, 220, 1945.
Discussion of standards and recommendations for home freezers.
938. Home Freezing Cabinet for Fish. D. K. Tressler. F.G. 62, No. 2, 56, 88, 1945.
Methods of packaging fish for home freezers are described.
939. Locker Operators Now Realize Freezing Cabinets Aid Business. D. K. Tressler. Frosted Food Field 4, No. 2, 4-5, Feb. 1947.
Consumption of frozen foods depends not only on availability but also on the familiarity of the housewife with them and her ability to store them.
940. Distribution of Fish by Frozen Food Locker Plants. Leo Young. Western Fisheries 29, No. 6, 11, 1945.
Methods of distribution and plant arrangement are discussed.
941. Merchandising Fish Through Locker Plants. Leo Young. Q.F.F. 2, No. 11, 134, 1947.
The frozen food locker plant in the midwest is ideally adapted to merchandising frozen fishery products.

Miscellaneous

942. Why It is Important to Vapor Seal Freezer Wall Insulation. Anon. N.P. 116, No. 14, 17, 1947.
The high water vapor pressure of outside air is constantly trying to force its way through the insulation to the low pressure area inside the freezer.

943. How to Determine Frozen Food Storage Room Humidity. W. J. Finnegan. Canner 105, No. 19, 18-20, 1947.
R. H. may be determined by reading the coil and room air temperature and calculating the difference for reference to a calibrated chart.
944. The Protection of Cold Storage Insulation with Bitumen. W. J. Finnegan. I.&R. 111, No. 5, 23-28, 1946.
Essential properties of vapor-proofing with asphalt are discussed.
945. Refrigerants—Their Physical and Refrigerating Properties. G. R. King. I.&R. 109, No. 6, 41-45, 1946.
The discussion includes ammonia, freon refrigerants, carbon dioxide, and less common refrigerants.
946. Insulation and Its Uses—Part I and II. P. E. Thomas. R.E. 50, No. 4, 319-323; No. 5, 427-428, 1945.
Cellular materials offer greater resistance to the passage of water and vapor than do fluffed, interlaced, or matted fibers.
947. Thermal Conductivity, Expansion, and Specific Heat of Insulators at Extremely Low Temperatures. G. B. Wilkes. R.E. 52, No. 1, 37-42, 1946.
Properties of seven types of insulation are listed for temperatures of -300° F. to 170° F.
948. Insulation Studies—Part I and II. O. C. Young. P.R.P.S., No. 67, 27-30, June 1946; No. 70, 4-8, March 1947.
The shock resistance of various insulating materials and the drying rates of insulated panels were determined.

PERIODICAL ABBREVIATIONS USED

- A.E. Agricultural Engineering. American Society of Agricultural Engineers, Benton Harbor, Mich.
- A.F. Atlantic Fisherman.
- B.B.C. Biological Board of Canada--Department of Fisheries, Ottawa, Canada.
- C.A. Chemical Abstracts. The American Chemical Society, Mills Building, Washington, D. C.
- C.B. Canadian Biology, Contributions to. 1901-1925; University of Toronto Press for Fisheries Research Board of Canada, Ottawa, Ontario, Canada.
- C.B.F. Canadian Biology and Fisheries, 1926-1934; Contributions to. University of Toronto Press for Fisheries Research Board of Canada, Ottawa, Ontario, Canada.
- C.F. Canadian Fisherman. National Business Publications, Ltd., Gardenvale, Quebec, Canada.
- C.J.R. Canadian Journal of Research, National Research Council, Ottawa, Canada.
- C.&I. Chemistry and Industry. The Society of Chemical Industry. Clifton House, Ruxton Road, London, N. W. 1, England.
- F.G. Fishing Gazette. Fishing Gazette Publication Corporation, 461 Eighth Avenue, New York, N. Y.
- F.I. Food Industries. McGraw-Hill Publishing Company, 330 W. 42nd St., New York, N. Y.
- F.R. Food Research. Twin City Printing Company, Champaign, Ill.
- F.T. Food Technology, name changed December, 1932 with vol. 2, No. 4 to Food, processing, packing, marketing. 33 Tothill St., Westminster, London S. W. 1, England.
- I.B.R. International Bulletin of Information on Refrigeration. (English edition of Bulletin de l'institut international du froid). Name changed with Vol. 15, No. 1 (Jan., 1934) to Bulletin of the International Institute of Refrigeration. J. F. Nickerson, 433 N. Waller Avenue, Chicago, Ill.
- I.&C.S. Ice and Cold Storage, 35 Foster Lane, Cheapside, London E.C. 2, England.
- I.&R. Ice and Refrigeration. Nickerson & Collins Company, 435 N. Waller Avenue, Chicago, Ill.
- J.A.C.S. The Journal of the American Chemical Society. Mills Building, Washington, D. C.
- I.E.C. Industrial and Engineering Chemistry. Mills Building, Washington, D. C.
- J.I.E.C. Journal of Industrial and Engineering Chemistry. Name changed with Vol. 15, No. 1, (Jan. 1923) to Industrial and Engineering Chemistry.
- J.S.C.I. Journal of the Society of Chemical Industry. Includes Chemistry and Industry, Transactions and British Chemical Abstracts B. Central House, 46 Finsbury Square, London E.C. 2, England.
- M.R. Modern Refrigeration. Truslove and Bray, Ltd., Knight's Hill West Norwood S.E. 27, Empire House, St. Martin's -Le-Grand, London, E.C. 1, England.