

REFERENCES

- Amano, K. and Yamada, K. 1964. A biological formation of FA in the muscle tissue of gadoid fish. *Nippon Suisan Gakkaishi*. 30: 430–435.
- Amano, K. and Yamada, K. 1965. The biological formation in cod flesh. In *Technology of Fish Utilization*. (Kreutzer, R., ed.). pp. 73–78. News Books. London.
- Amano, K., Yamada, K. and Bito, M. 1963. Content of formaldehyde and volatile in different tissues of gadoid fish. *Bull. Jpn. Soc. Sci. Fish.* 29: 860–864.
- Ando, M., Toyohara, H., Shimizu, Y. and Sakguchi, M. 1991. Postmortem tenderization of rainbow trout (*Oncorhynchus mykiss*) muscle caused by gradual disintegration of the extracellular matrix structure. *J. Sci. Food Agric.* 55: 589–592.
- Ang, J. F. and Hultin, H. O. 1989. Denaturation of cod myosin during freezing after modification with formaldehyde. *J. Food Sci.* 54: 814–818.
- Aro, T., Talvonen, R., Koskinen, L. and Kallio, H. 2003. Volatile compounds of Baltic herring analysed by dynamic headspace sampling gas chromatography-mass spectrometry. *Eur. Food Res. Technol.* 216: 483–488.
- Arteaga, G. E. 1994. Assessment of protein surface hydrophobicity by spectroscopic methods and its relation to emulsifying properties of proteins. Ph.D. thesis, Department of Food Science, The University of British Columbia, Vancouver, B.C., Canada.
- Aubourg, S. P. 1999. Lipid damage detection during the frozen storage of an underutilized fish species. *Food Res. Int.* 32: 497–502.
- Aubourg, S. P. and Medina, I. 1999. Influence of storage time and temperature on lipid deterioration during cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) frozen storage. *J. Sci. Food Agric.* 79: 1943–1948.
- Ayyad, K. and Aboel-Niel, E. 1991. Effect of addition of some hydrocolloids on the stability of frozen minced fillet of mackerel. *Carbohydr. Polym.* 15: 143–149.
- Azuma, Y. and Konno, K. 1998. Freeze denaturation of carp myofibril compared with thermal denaturation. *Fish. Sci.* 64: 287–290.
- Babbit, J. K., Crawford, D. L. and Law, D. K. 1972. Decomposition of trimethylamine oxide and changes in protein extractability during frozen storage of minced and intact hakes (*Merluccius productus*) muscle. *J. Agric. Food Chem.* 20: 1052–1054.

- Badii, F. and Howell, N. K. 2001. A comparison of biochemical changes in cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*) during frozen storage. *J. Sci. Food Agric.* 82: 87–97.
- Badii, F. and Howell, N. K. 2002a. Effect of antioxidants, citrate, and cryoprotectants on protein denaturation and texture of frozen cod (*Gadus morhua*). *J. Agric. Food Chem.* 50: 2053–2061.
- Badii, F. and Howell, N. K. 2002b. Changes in the texture and structure of cod and haddock fillets during frozen storage. *Food Hydrocolloids.* 16: 313–319.
- Banda, M.C.M. and Hultin, H.O. 1983. Role of cofactors in breakdown of TMAO in frozen red hake muscle. *J. Food Proc. Preserv.* 7: 221–236.
- Banerjee, S. 2006. Inhibition of mackerel (*Scomber scombrus*) muscle lipoxygenase by green tea polyphenols. *Food Res. Int.* 39: 486–491.
- Barroso, M., Careche, M. and Borderias, A. J. 1998. Quality control of frozen fish using rheological techniques. *Trends Food Sci. Technol.* 9: 223–229.
- Belitz, H. D. and Grosch, W. 1999. *Food Chemistry.* Springer, Berlin, New York. Heidelberg.
- Benjakul, S. and Bauer, F. 2000. Physicochemical and enzymatic changes of cod muscle proteins subjected to different freeze-thaw cycles. *J. Sci. Food Agric.* 80: 1143–1150.
- Benjakul, S. and Bauer, F. 2001. Biochemical and physicochemical changes in catfish (*Silurus glanis* Linne) muscle as influenced by different freeze-thaw cycles. *Food Chem.* 72: 207–217.
- Benjakul, S. and Morrissey, M. T. 1997. Protein hydrolysates from Pacific whiting solid wastes. *J. Agric. Food Chem.* 45: 3423–3430.
- Benjakul, S., Seymour, T. S., Morrissey, M. T. and An, H. 1997. Physicochemical changes in Pacific whiting muscle proteins during iced storage. *J. Food Sci.* 62: 729–733.
- Benjakul, S., Visessanguan, W. and Leelapongwattana, K. 2002. Characteristics of muscle from two species of bigeye snapper, *Priacanthus tayenus* and *Priacanthus macracanthus*. *J. Food Biochem.* 26: 307–326.
- Benjakul, S., Visessanguan, W. and Tanaka, M. 2003a. Partial purification and characterization of trimethylamine-N-oxide demethylase from lizardfish kidney. *Comp. Biochem. Physiol.* 135B: 359–371.

- Benjakul, S., Visessanguan, W. and Tueksaban, J. 2003b. Changes in physico-chemical properties and gel-forming ability of lizardfish (*Saurida tumbil*) during post-mortem storage in ice. *Food Chem.* 80: 535-544.
- Benjakul, S., Visessanguan, W., Thongkaew, C. and Tanaka, M. 2003c. Comparative study on physicochemical changes of muscle proteins from some tropical fish during frozen storage. *Food Res. Int.* 36: 787-795.
- Benjakul, S., Visessanguan, W. and Tanaka, M. 2004. Induced formation of dimethylamine and formaldehyde by lizardfish kidney trimethylamine-N-oxide demethylase. *Food Chem.* 84: 297-305.
- Benjakul, S., Visessanguan, W., Ishizaki, S. and Tanaka, M. 2001. Differences in gelation characteristics of natural actomyosin from two species of bigeye snapper, *Priacanthus tayenus* and *Priacanthus macracanthus*. *J. Food Sci.* 66: 1311-1318.
- Benjakul, S., Visessanguan, W., Thongkaew, C. and Tanaka, M. 2005. Effect of frozen storage on chemical and gel-forming properties of fish commonly used for surimi production in Thailand. *Food Hydrocolloids.* 19: 197-207.
- Borresen, T. 1995. Chemical composition. In *Quality and Quality Changes in Fresh Fish*. (Huss, H. H., ed.). pp. 20-34. Rome FAO. Italy.
- Bouraoui, M., Nakai, S. and Li-Chan, E. Y. C. 1997. *In situ* investigation of protein structure in Pacific whiting surimi and gels using Raman spectroscopy. *Food Res. Int.* 30: 65-72.
- Bradford, M. M. 1976. A rapid and sensitive method for the quantitation of microorganism quantities of protein utilizing the principal of protein dye binding. *Anal. Biochem.* 72: 248-254.
- Brand-Williams, W., Cuvelier, M. E. and Berset, C. 1995. Use of free radical method to evaluate antioxidant activity. *Food Sci. Technol.* 28: 25-30.
- Brannan, R. G. and Erickson, M. C. 1996. Quantification of antioxidant in channel catfish during frozen storage. *J. Agric. Food Chem.* 44: 1361-1366.
- Brown, W. D. 1986. Fish muscle as food. In *Muscle as Food*. (Bechtel, P.J., ed.). pp. 36-54. Academic Press. London.
- Brzezinski, B. and Zundel, G. 1993. Formation of disulphide bonds in the reaction of SH group-containing amino acids with trimethylamine N-oxide: a regulatory mechanism in proteins. *FEBS Lett.* 333: 331-333.

- Buttkus, H. 1970. Accelerated denaturation of myosin in frozen solution. *J. Food Sci.* 35: 558-562.
- Buttkus, H. 1971. The sulphydryl content of rabbit and trout myosins in relation to protein stability. *Can. J. Biochem.* 49: 97-102.
- Buttkus, H. 1974. On the nature of the chemical and physical bonds which contribute to some structural properties of protein foods: a hypothesis. *J. Food Sci.* 39: 484-489.
- Careche, M. and Li-Chen, E. 1997. Structural changes and Raman spectroscopic studies of cod myosin upon modification with formaldehyde or frozen storage. *J. Food Sci.* 62: 717-723.
- Careche, M. and Tejada, M. 1990. The effect of neutral and oxidized lipids on functionality in hake (*Merluccius merluccius*): a dimethylamine and formaldehyde forming species during frozen storage. *Food Chem.* 36: 113-128.
- Careche, M. and Tejada, M. 1994. Hake natural actomyosin interaction with free fatty acids during frozen storage. *J. Sci. Food Agric.* 64: 501-507.
- Careche, M. and Reece, P. 1992. Production of formaldehyde in frozen fish. Confidential Report TD 248, Torry Research Station. Aberdeen, UK.
- Careche, M., Del Mazo, M. L., Torrejon, P. and Tejada, M. 1998a. Emulsifying and gelation properties during freezing and frozen storage of hake, pork, and chicken actomyosins as affected by addition of formaldehyde. *J. Agric. Food Chem.* 46: 813-819.
- Careche, M., Del Mazo, M. L., Torrejon, P. and Tejada, M. 1998b. Importance of frozen storage temperature in the type of aggregation of myofibrillar proteins in cod (*Gadus morhua*) fillets. *J. Agric. Food Chem.* 46: 1539-1546.
- Careche, M., Garcia, M. L., Herrero, A., Solas, M. T. and Carmona, P. 2002. Structural properties of aggregates from frozen stored hake muscle proteins. *J. Food Sci.* 67: 2827-2832.
- Careche, M., Herrero, A. M., Rodriguez-Casado, M. L., Del Mazo, M. L. and Carmona, P. 1999. Structural changes of hake (*Merluccius merluccius* L.) fillets: effects of freezing and frozen storage. *J. Agric. Food Chem.* 47: 952-959.
- Castell, C. H. and Smith, B. 1973. Measurement of formaldehyde in fish muscle using TCA extraction and the Nash reagent. *J. Fish Res. Board. Can.* 30: 91-98.

- Castell, C. H., Smith, B. and Dale, J. 1973. Comparison of changes in trimethylamine, dimethylamine and extractable protein in iced and frozen gadoid fillets. *J. Fish Res. Board. Can.* 30: 1246-1248.
- Castell, C. H., Smith, B. and Neal, W. 1971. Production of dimethylamine in muscle of several species of gadoid fish during frozen storage, especially in relation to presence of dark muscle. *J. Fish. Res. Board Can.* 28: 1-5.
- Cava, R., Ventanas, J., Tejada, J. F., Ruiz, J. and Antequera, T. 2000. Effect of free-range rearing and α -tocopherol and copper supplementation on fatty acid profiles and susceptibility to lipid oxidation of fresh meat from Iberian pigs. *Food Chem.* 68: 51-59.
- Chen, Y. 1992. Characterization of semi-purified collagenase fraction lobster hepatopancreas. M.Sc. Thesis, McGill University, Montreal, Canada.
- Connell, J. J. 1960. Changes in the action of cod flesh during storage at -14°C . *J. Sci. Food Agric.* 11: 515-519.
- Connell, J. J. 1961. The relative stabilities of the skeletal muscle myosin of some animals. *J. Biochem.* 80: 503-509.
- Connell, J. J. 1975. The role of formaldehyde as a protein crosslinking agent acting during the frozen storage of cod. *J. Sci. Food Agric.* 26: 1925-1929.
- Conway, E. J. and Byrne, A. 1936. An absorption apparatus for the micro determination of certain volatile substances. I. The micro-determination of ammonia. *Biochem. J.* 27: 419-429.
- Crawford, D. L., Law, D. K., Babbit, J. K. and McGill, L. A. 1979. Comparative stability and desirability of frozen Pacific hake fillet and minced flesh blocks. *J. Food Sci.* 44: 363-367.
- DaPonte, D. J. B., Roozen, J. P. and Pilnik, W. 1986. Effect of additions, irradiation, and heating on the activity of trimethylamine oxidase in frozen stored minced fillets of whiting. *J. Food Technol.* 21: 33-43.
- Davies, J. R., Bardsley, R. O. and Ledward, D. A. 1988. Myosin thermal stability in fish muscle. *J. Sci. Food Agric.* 45: 61-68.
- Del Mazo, M. L., Huidobro, A., Torrejon, P., Tejada, M. and Careche, M. 1994. Role of formaldehyde in formation of natural actomyosin aggregates in hake during frozen storage. *Z. Lebensm. Untersuch. Forsch.* 198: 459-464.

- Del Mazo, M. L., Torrejon, P., Careche, M. and Tejada, M. 1999. Characteristics of the salt-soluble fraction of hake (*Merluccius merluccius*) fillets stored at -20 and -30°C. *J. Agric. Food Chem.* 47: 1372-1377.
- Dileep, A. O., Shamasundar, B. A., Binsi, P. K., Badii, F. and Howell, N. K. 2005. Effect of ice storage on the physicochemical and dynamic viscoelastic properties of ribbonfish (*Trichiurus* spp.) meat. *J. Food Sci.* 70: 537-545.
- Dingle, J. R. and Hines, J. A. 1975. Protein instability in frozen flesh from fillets and frames of several commercial Atlantic fishes during storage at -5°C. *J. Fish Res. Board. Can.* 32: 775-783.
- Dingle, J. R., Keith, R. A. and Lall, B. 1977. Protein instability in frozen storage induced in minced muscle of flat fishes by mixture of muscle of red hake. *Can. Inst. Food Sci. Technol. J.* 10: 143-146.
- Doi, E. 1993. *Principles of Food Chemistry*. 2nd edition. Aspen Publishers. New York.
- Dunajski, E. 1979. Texture of fish muscle. *J. Text. Stud.* 10: 301-318.
- Dyer, W. J. and Dingle, J. R. 1961. Fish proteins with special reference to freezing. In *Fish as Food. I. Biochemistry and Microbiology*. (Borgstrom, G., ed.). pp. 275-327. Academic Press. New York.
- Egelandsdal, B., Fretheim, K. and Samejima, K. 1986. Dynamic rheological measurement on heat-induced myosin gels: effect of ionic strength, protein concentration and addition of adenosine tripolyphosphate or pyrophosphate. *J. Sci. Food Agric.* 37: 915-926.
- Ellman, G.L. 1959. Tissue sulfhydryl groups. *Arch. Biochem. Biophys.* 82: 70-77.
- Fennema, O. 1982. Behavior of proteins at low temperatures. In *Food Protein Deterioration: Mechanisms and Functionality*. (Cherry, J.P., ed.). pp. 109. ACS Symp. Washington, D.C.
- Franks, F. 1995. Protein destabilization at low temperatures. *Adv. Protein Chem.* 46: 105-139.
- Gill, T. 1995. Autolytic changes. In *Quality and Quality Changes in Fresh Fish*. (Huss, H.H., ed.). pp. 39-50. Rome FAO. Italy.
- Gill, T. A. and Paulson, A. T. 1982. Localization, characterization and partial purification of TMAO-ase. *Comp. Biochem. Physiol.* 71B: 49-56.

- Gill, T. A., Keith, R. A., and Smith, L. B. 1979. Textural deterioration of red hake and haddock muscle in frozen storage as related to chemical parameters and changes in the myofibrillar proteins. *J. Food Sci.* 44: 661–667.
- Goodband, R. 2002. Functional properties of fish proteins. In *Seafoods-Quality, Technology and Nutraceutical Applications*. (Alasalvar, C. and Taylor, T., eds.). pp. 73–82. Springer. Germany.
- Gray, J. I., Gomma, E. A and Bokly, D. J. 1996. Oxidative quality and shelf life of meats. *Meat Sci.* 43: S111–S115.
- Gupta, M. N., Jain, S. and Roy, I. 2002. Immobilized metal affinity chromatography without chelating ligands: purification of soybean trypsin inhibitor on zinc alginate beads. *Biotechnol. Prog.* 18: 78–81.
- Haard, N.F. 1990. Influence of holding fillets from undersize Atlantic cod (*Gadus morhua*) at 0°C or -3°C on the yield and quality of surimi. In *Engineered Seafood Including Surimi*. (Martin, R. E. and Collette, R. L., eds.). pp. 89–111. NJ: Noyes Cooperation. Park Ridge.
- Haard, N. F. 1992. Biochemical reactions in fish muscle during frozen storage. In *Seafood Science and Technology* (Bligh, E. C., ed.). pp. 176–209. Fishing News Books. London.
- Hamada, I., Tsuji, K., Nakayama, T. and Niwa, E. 1977. Oxidative denaturation of actomyosin. *Bull. Jpn. Soc. Sci. Fish.* 43: 1105–1109.
- Hamann, D. D. 1991. Rheology. A tool for understanding thermally induced protein gelation. In *Interactions of Food Proteins*. (Pariss, N. and Barford R., eds.). pp. 212–227. American Chemical Society. Washington, DC.
- Hamm, R. 1979. Delocalization of mitochondrial enzymes during freezing and thawing of skeletal muscle. In *Protein at Low Temperatures, Advances in Chemistry Series*. (Fennema, O. R., ed.). pp. 191–204, American Chemical Society. Washington, DC.
- Hamre, K., Lie, O. and Sandnes, K. 2003. Development of lipid oxidation and flesh colour in frozen stored fillets of Norwegian spring-spawning herring (*Clupea harengus* L.). Effect of treatment with ascorbic acid. *Food Chem.* 82: 447–453.
- Harada, K. 1975. Studies on the enzyme catalyzing the formation of formaldehyde and dimethylamine in tissues of fishes and shells. *J. Shimonoseki Univ. Fish.* 23: 163–241.

- Harris, P. and Tall, J. 1994. Rancidity in fish. In *Rancidity in Foods* (Allen, J.C. and Hamilton, R. J., eds.). pp. 256–272. Chapman & Hall. London, UK.
- Hatae, K. 1994. Studies on the texture of fish meat. *Nippon Suisan Gakkaishi*. 60: 317–321.
- Hatano, S. 1968. Effect of freezing and storage on the enzyme activities. *Refrigeration (Tokyo)*. 43: 14–20.
- Hayakawa, S. and Nakai, S. 1985. Contribution of hydrophobicity, net charge, and sulfhydryl groups to thermal properties of ovalbumin. *Can. Inst. Food Sci. Technol. J.* 18: 290–295.
- Herrera, J. J., Bernardez, M., Sampedro, G., Cabo, M. and Pastoriza, L. 2006. Possible role for cryostabilizers in preventing protein and lipid alterations in frozen-stored minced muscle of Atlantic mackerel. *J. Agric. Food Chem.* 54: 3324–3333.
- Herrera, J. J., Pastoriza, L. and Sampedro, G. 2000. Inhibition of formaldehyde production in frozen-stored minced blue whiting (*Micromesistius poutassou*) muscle by cryostabilizers: an approach from the glassy state theory. *J. Agric. Food Chem.* 48: 5256–5262.
- Herrera, J. J., Pastoriza, L. and Sampedro, G. 2001. A DSC study on the effects of various maltodextrins and sucrose on protein changes in frozen-stored minced blue whiting muscle. *J Sci. Food Agric.* 81: 377–384.
- Herrera, J. J., Pastoriza, L. and Sampedro, G. 2002. Effects of various cryostabilisers on protein functionality in frozen-stored minced blue whiting muscle: the importance of inhibiting formaldehyde production. *Eur. Food Res. Technol.* 214: 382–387.
- Herrera, J. J., Pastoriza, L., Sampedro, G. and Cabo, M. 1999. Effect of various cryostabilizers on the production and reactivity of formaldehyde in frozen-stored minced blue whiting muscle. *J. Agric. Food Chem.* 47: 2386–2397.
- Hill, A. R., Irvine, D.M. and Bullock, D.H. 1982. Precipitation and recovery of whey proteins. A review. *Can. Inst. Food Sci. Technol. J.* 15: 155–160.
- Hiltz, D. F., Smith, L. B., Lemon, D. W. and Dyer, W. J. 1976. Deterioration changes during frozen storage in fillets and minced flesh of silver hake (*Merluccius bilinearis*) processed. *J. Fish Res. Board Can.* 33: 2560–2567.
- Howell, N. K. and Lawrie, R. A. 1985. Functional aspects of blood plasma proteins 4. Elucidation of the mechanism of gelation of plasma and egg albumen protein. *J. Food Technol.* 20: 489–504.

- Howell, N. K. and Li-Chan, E. C. Y. 1996. Elucidation of interactions of lysozyme with whey proteins by Raman spectroscopy. *Int. J. Food Sci. Technol.* 31: 439–451.
- Howell, N., Shavila, Y., Grootveld, M. and Williams, S. 1996. High-resolution NMR and magnetic resonance imaging (MRI) studies on fresh and frozen cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). *J. Sci. Food Agric.* 72: 49–56.
- Huidobro, A., Mohamed, G. F. and Tejada, M. 1998. Aggregation of myofibrillar proteins in hake, sardine and mixed minces during frozen storage. *J. Agric. Food Chem.* 46: 2601–2608.
- Hultin, H. O. 1992. Trimethylamine-N-oxide (TMAO) demethylation and protein denaturation in fish muscle. In *Advances in Seafood Biochemistry: Composition and Quality*. (Flick, G.J. and Martin, R.E., eds.). pp. 25–42. Technomic Publishing. Lancaster, PA.
- Inoue, N., Takatori, K., Motoshige, T. and Shinano, H. 1992. Effect of storage temperature on the freeze denaturation of fish myosin B. *Nippon Suisan Gakkaishi*. 58: 2357–2360.
- Jahncke, M., Baker, R. C. and Regenstein, J. M. 1992. Frozen storage of unwashed cod (*Gadus morhua*) frame mince with and without kidney tissue. *J. Food Sci.* 57: 575–580.
- Jarenback, L. and Lijimark, A. 1975. Ultrastructural changes during frozen storage of cod (*Gadus morhua* L.). II. Structure of extracted myofibrillar proteins and myofibril residues. *J. Food Technol.* 10: 309–325.
- Jiang, S. T. and Lee, T. C. 1985. Changes in free amino acids and protein denaturation of fish muscle during frozen storage. *J. Agric. Food Chem.* 33: 839–844.
- Jiang, S.T., Ho, M.L. and Lee, T.C. 1985. Optimization of the freezing conditions on mackerel and amberfish for manufacturing minced fish. *J. Food Sci.* 50: 727–732.
- Jiang, S.T., Hwang, B.S. and Tsao, C.Y. 1987. Protein denaturation and changes in nucleotides of fish muscle during frozen storage. *J. Agric. Food Chem.* 35: 22–27.
- Jiang, S. T., Hwang, B. S. and Chen, C. S. 1988a. Effect of storage temperatures on the formation of disulfides and denaturation of milkfish actomyosin (*Chanos chanos*). *J. Food Sci.* 53: 1333–1335.

- Jiang, S. T., Hwang, B. S. and Chen, C. S. 1988b. Denaturation and change in SH group of actomyosin from milkfish (*Chanos chanos*) during storage at -20°C. J. Agric. Food Chem. 36: 433-437.
- Jiang, S. T., Lan, C. C. and Tsao, C. Y. 1986. New approach to improve the quality of minced fish products from freeze-thawed cod and mackerel. J. Food Sci. 51: 310-312, 351.
- Jiang, S. T., San, P. C. and Japit, L. S. 1989. Effect of storage temperatures on the formation of disulfides and denaturation of tilapia hybrid actomyosin (*Tilapia nilotica* × *Tilapia aurea*). J. Agric. Food Chem. 37: 633-636.
- Jittinadana, S., Kenney, P. B. and Slider, S. D. 2003. Cryoprotection affects physiochemical attributes of rainbow trout fillets. J. Food Sci. 68: 1208-1214.
- Johnston, I. A., Frearson, N. and Goldspink, G. 1973. The effects of environmental temperature on the properties of myofibrillar adenosine triphosphatase from various species of fish. Biochem. J. 133: 735-738.
- Joly, A., Cotin, P., Han-Ching, L. and Ducastaing, A. 1992. Trimethylamine-N-oxide demethylase (TMAOase) of saithe (*Pollachius virens*) kidney: a study of some physicochemical and enzymatic properties. J. Sci. Food Agric. 59: 261-267.
- Josephson, D. and Lindsay, R. 1986. Enzymatic generation of volatile aroma compounds from fresh fish. In Biogeneration of Aromas. (Parliament, T. and Croteau, R., eds.). pp. 201-219. ACS Symposium series 317, American Chemical Society. Washington, DC.
- Kamal-Eldin, A. and Appelqvist, L-A. 1996. The chemistry and antioxidant properties of tocopherols and tocotrienols. Lipids. 31: 671-701.
- Kato, A. and Nakai, S. 1980. Hydrophobicity determined by fluorescence probe method and its correlation with surface properties of proteins. Biochem. Biophys. Acta. 624: 13-20.
- Khayat, A. and Schwall, D. 1983. Lipid oxidation in seafood. Food Technol. 37(7): 130-140.
- Kielley, W. W. and Bradley, L. B. 1956. The relationship between sulphhydryl groups and the activation of myosin adenosinetriphosphatase. J. Biol. Chem. 218: 653-659.
- Kimura, M., Kimura, I. and Seki, N. 2003. TMAOase, trimethylamine-N-oxide demethylase, is a thermostable and active enzyme at 80°C. Fish. Sci. 69: 414-420.

- Kimura, M., Seki, N. and Kimura, I. 2000a. Occurrence and some properties of trimethylamine-*N*-oxide demethylase in myofibrillar fraction from walleye pollack muscle. *Fish. Sci.* 66: 725–729.
- Kimura, M., Seki, N. and Kimura, I. 2000b. Purification and characterization of trimethylamine-*N*-oxide demethylase from walleye pollack muscle. *Fish. Sci.* 66: 967–973.
- Kimura, I., Yoshitomi, B., Kenno, K. and Arai, K. 1980. Preparation of highly purified myosin from mantle muscle of squid *Onmastrephes sloani pacificus*. *Bull. Jpn. Soc. Sci. Fish.* 46: 885–889.
- Koshiyama, I., Hamano, M. and Fukushima, D. 1981. A heat denaturation study of the 11S globulin in soybean seeds. *Food Chem.* 6: 309–322.
- Kostuch, S. and Sikorski, Z. E. 1977. Proceeding of the International Institutes of Food and Refrigeration (IIF/IIR). Commissions C1 and C2. pp. 199–208. Karlsruhe.
- Krueger, D. J. and Fennema, O. R. 1989. Effect of chemical additives on toughening of fillets of frozen storage Alaska pollack (*Theragra chacogramma*). *J. Food Sci.* 54, 1101–1106.
- Ladikos, D. and Lougovois, V. 1990. Lipid oxidation in muscles: a review. *Food Chem.* 35: 295.
- Laird, W. M. and Mackie, I. M. 1981. Protein changes during frozen storage of cod. In Advances in the Refrigerated Treatment of Fish: Refrigeration Science and Technology. pp. 395–400. I.I.R. Commissions C2, D1, D2, D3. Boston, MA.
- Lall, B. S., Manzer, A. R. and Hiltz, D. F. 1975. Preheat treatment for improvement of frozen storage stability at -10°C in fillets and minced flesh of silver hake (*Merluccius bilinearis*). *J. Fish. Res. Board Can.* 32: 1450–1454.
- Landolt, L. A. and Hultin, H. O. 1982. Inhibition of dimethylamine formation in frozen red hake muscle after removal of trimethylamine oxide and soluble proteins. *J. Food Biochem.* 6: 111–125.
- Lawrie, R. A. 1991. *Meat Science*. 5th ed. Pergamon Press. New York.
- LeBlanc, E. L. and LeBlanc, R. J. 1989. Separation of cod (*Gadus morhua*) fillet proteins by electrophoresis and HPLC after various frozen storage treatments. *J. Food Sci.* 53: 328–340.
- LeBlanc, E. L., LeBlanc, R. J. and Blum, I. E. 1988. Prediction of quality in frozen cod (*Gadus morhua*) fillets. *J. Food Sci.* 53: 328–340.

- Leelapongwattana, K., Benjakul, S., Visessanguan, W. and Howell, N. K. 2005a. Physicochemical and biochemical changes during frozen storage of minced flesh of lizardfish (*Saurida micropectoralis*). *Food Chem.* 90: 141–150.
- Leelapongwattana, K., Benjakul, S., Visessanguan, W. and Howell, N. K. 2005b. Physicochemical and biochemical changes in whole lizardfish (*Saurida micropectoralis*) muscles and fillets during frozen storage. *J. Food Biochem.* 29: 547–569.
- Leelapongwattana, K., Benjakul, S., Visessanguan, W. and Howell, N. K. 2007. Effect of trimethylamine-N-oxide demethylase from lizardfish kidney on biochemical changes of haddock natural actomyosin stored at 4 and -10°C. *Eur. Food Res. Technol.* in press.
- Li-Chan, E. Y. C., Nakai, S. and Hirotsuka, M. 1994. Raman spectroscopy as a probe of protein structure in food systems. In *Protein Structure–Function Relationships in Foods*. (Yada, R. Y., Jackman, R. L. and Smith, J. L. eds.). pp. 164–197. London: Blackie Academic and Professional.
- Lindelov, F. 1976. Reactions in frozen foods. IIR, joint meeting of Commissions C2, D1, D2, D3, E1. Melbourne.
- Lippert, J. L., Tyminski, D. and Desmeules, P. J. 1976. Determination of the secondary structure of proteins by laser Raman spectroscopy. *J. Am. Chem. Soc.* 98: 7075–7080.
- Love, R. M. 1968. Ice formation in frozen muscle. In *Low Temperature Biology of Foodstuffs*. (Hawthorn, J. and Rolfe, E.J., eds.). pp. 105–124. Pergamon Press. Oxford.
- Lowry, Q. H., Rosebrough, N. J., Farr, L. A. and Randall, R. J. 1951. Protein measurement with the Folin phenol reagent. *J. Biol. Chem.* 193: 256–275.
- Lundstrom, R. C., Correia, F. F. and Wilhelm, K. A. 1982. Enzymatic dimethylamine and formaldehyde production in minced American plaice and backbone flounder mixed with a red hake TMAOase active fraction. *J. Food Sci.* 47: 1305–1310.
- Lundstrom, R. C., Correia, F. F. and Wilhelm, K. A. 1983. Dimethylamine production in fresh red hake (*Urophycis chuss*): the effect of packaging material oxygen permeability and cellular damage. *J. Food Biochem.* 6: 229–241.
- MacDonald, G. A. and Lanier, T. 1991. Carbohydrates as cryoprotectants for meats and surimi. *Food Technol.* 45(3): 150–159.

- Makie, I. M. 1993. The effects of freezing on flesh proteins. *Food Rev. Int.* 9: 575–610.
- Makie, I. M. and Thompson, B. W. 1974. Decomposition of trimethylamine oxide during iced and frozen-storage of whole and comminuted tissue of fish. *Proc. IV Int. Congress Food Sci. Technol.* 1: 243–250.
- Martone, C. B., Busconi, L., Folco, E. J., Trucco, R. E. and Sanchez J. J. 1986. A simplified myosin preparation from marine fish species. *J. Food Sci.* 51: 1554–1555.
- Matsumoto, J. J. 1980. Chemical deterioration of muscle proteins during frozen storage. In *Chemical Deterioration of Proteins*. (Whitaker, J. R. and Fujimaki, M., eds.). pp. 95–124. ACS Symposium Series 123, American Chemical Society. Washington, DC.
- Meynier, A., Rampon, V., Dalgalarondo, M. and Genot, C. 2004. Hexanal and *t*-2 hexanal from covalent bonds with whey proteins and sodium caseinate in aqueous solution. *Int. Dairy J.* 14: 681–690.
- Montejano, J. G., Hamann, D. D. and Lanier, T. C. 1983. Final strengths and rheological changes during processing of thermally induced fish muscle gels. *J. Rheol.* 27: 557–579.
- Morrissey, M. T. and Tan, S. M. 2000. World resources for surimi. In *Surimi and Surimi Seafood* (Park, J.W., ed.). pp. 1–21. Marcel Dekker. New York, USA.
- Nash, T. 1953. The colorimetric estimation of formaldehyde by means of the Hantzsch reaction. *Biochem. J.* 55: 416–421.
- Nielsen, M. K. and Jorgensen, B. M. 2004. Quantitative relationship between trimethylamine oxide aldolase activity and formaldehyde accumulation in white muscle from gadiform fish during frozen storage. *J. Agric. Food Chem.* 52: 3814–3822.
- Niwa, E. 1985. Functional aspects of surimi. In *Proceeding of the International Symposium on Engineered Seafood Including Surimi*. (Martin, R.E. and Collette, R.L., eds.). pp. 141–147. National Fisheries Institute. Washington DC, USA.
- Offer, G. 1987. Myosin filaments. In *Fibrous Protein Structure*. (Squire, J. M. and Vibert, P. J., eds.). pp. 307–357. Academic Press. London.
- Ogawa, M., Ehara, T., Tamiya, T. and Tsuchiya, T. 1993. Thermal stability of fish myosin. *Comp. Biochem. Physiol.* 106B: 517–521.

- Ogawa, M., Tamiya, T. and Tsuchiya, T. 1994. Structural changes of carp myosin during heating. *Fish. Sci.* 60: 723–727.
- Oguni, M., kubo, T. and Matsumoto, J. J. 1975. Studies on the denaturation of fish muscle proteins I, physico-chemical and electron microscopical studies of freeze-denaturation of carp actomyosin. *Bull. Jpn. Soc. Sci. Fish.* 41: 1113–1119.
- Olley, J., Pirie, R. and Watson, H. 1962. Lipase and phospholipase activity in fish skeletal muscle and its relationship to protein denaturation. *J. Sci. Food Agric.* 13: 501–516.
- Owusu-Ansah, Y. J. and Hultin, H. O. 1987. Effect of *in situ* formaldehyde production on solubility and crosslinking of proteins of minced red hake muscle during frozen storage. *J. Food Biochem.* 11: 17–39.
- Parkin, K. L. and Hultin, H. O. 1982a. Some factors influencing the production of dimethylamine and formaldehyde in minced and intact red hake muscle. *J. Food Process. Preserv.* 6: 73–97.
- Parkin, K. L. and Hultin, H. O. 1982b. Fish muscle microsomes catalyze the conversion of trimethylamine oxide to dimethylamine and formaldehyde. *FEBS Letts.* 139: 61–64.
- Parkin, K. L. and Hultin, H. O. 1986a. Characterization of trimethylamine-*N*-oxide (TMAO) demethylase activity from fish muscle microsomes. *J. Biochem.* 100: 77–86.
- Parkin, K. L. and Hultin, H. O. 1986b. Partial purification of trimethylamine-*N*-oxide (TMAO) demethylase from crude fish muscle miocrosomes. *J. Biochem.* 100: 87–97.
- Phillipy, B. Q. 1984. Characterization of the *in situ* TMAOase system of red hake muscle. Ph.D. thesis, University of Massachusetts, Amherst, MA.
- Phillipy, B. Q. and Hultin, H. O. 1993. Distribution and some characteristics of trimethylamine-*N*-oxide (TMAO) demethylase activity of red hake muscle. *J. Food Biochem.* 17: 235–250.
- Privalov, P. L. and Makhatadze, G. I. 1993. Contribution of hydration to protein folding thermodynamics. II. The entropy and Gibbs energy of hydration. *J. Mol. Biol.* 232: 660–679.

- Privalov, P. L. and Khechinashvili, N. N. 1974. A thermodynamic approach to the problem of stabilization of globular protein structure. A calorimetric study. *J. Mol. Biol.* 86: 665–684.
- Privalov, P. L., Griko, Y. V., Venyaminov, Y. S. and Kutyshenko, V. P. 1986. Cold denaturation of myoglobin. *J. Mol. Biol.* 190: 487–497.
- Powrie, W. D. 1973. Cryopreservation of egg yolk. In *Low-Temperature Preservation of Food and Living Matter*. (Fennema O.R., ed.). pp. 264–281. Marcel Dekker, Inc. New York.
- Racicot, L. D., Lundstrom, R. C., Wilhelm, K. A., Ravesi, E. M. and Licciardello, J. J. 1984. Effect of oxidizing and reducing agents on trimethylamine oxide demethylase activity in red hake muscle. *J. Agric. Food Chem.* 32: 459–464.
- Rahman, M. S. 1999. *Handbook of Food Preservation*. Marcel Dekker, Inc. New York
- Ramirez, J. A., Martin-Polo, M. O. and Bandman, E. 2000. Fish myosin aggregation as affected by freezing and initial physical state. *J. Food. Sci.* 65: 556–560.
- Reece, P. 1985. The fate reduced nicotinamide adenine dinucleotide in minced flesh of cod (*Gadus morhua*) and its association with formaldehyde production during frozen storage. In *Storage Lives of Chilled and Frozen Fish and Fish Products*. pp. 375–379. Proceedings of Commissions C2 and D3; International Institute of Refrigeration. Abereen, UK.
- Regenstein, J. M., Schlossner, M. A., Samson, A. and Fey, M. 1982. Chemical changes of trimethylamine oxide during fresh and frozen storage of fish. In *Chemistry and Biochemistry of Marine Food Products*. (Martin, R., Flick, G., Hebarb, C. and Ward, D., eds.). pp. 137–148. AVI Publishing. Westport.
- Rehbein, H. 1987. Trimethylamine oxide (TMAO) content and TMAOase activity in tissues of fish species from the North Atlantic and from Antarctic waters. In *The Role of Formaldehyde in Biological Systems*. (Tyihak, E. and Gullner, G., eds.). pp. 237–242. SOTE Press. Budapest.
- Rehbein, H. 1988. Relevance of trimethylamine oxide demethylase activity and haemoglobin content to formaldehyde production and texture deterioration in frozen stored minced fish muscle. *J. Sci. Food Agric.* 48: 261–277.
- Rehbein, H. and Schreiber, W. 1984. TMAOase activity in tissues of fish species from the Northeast Atlantic. *Comp. Biochem. Physiol.* 79B: 447–452.

- Reische, D., Lillard, W. D. A. and Eitenmiller, R. R. 1998. Antioxidant. In Food Lipids: Chemistry, Nutrition, and Biotechnology. (Akoh, C. C. and Min, D., eds.). pp. 423–448. Marcel Decker. New York.
- Rey-Mansilla, M. M., Perez-Testa, M., Aubourg, S. and Sotelo, C. G. 1997. Formaldehyde production and localization during the frozen storage of European hake (*Merluccius merluccius* L.). WEFTA meeting. Madrid.
- Rey-Mansilla, M. M., Sotelo, C. G. and Moran, R. M. 2004. Partial purification and biochemical characterization of TMAOase from kidney of European hake (*Merluccius merluccius*). Eur. Food Res. Technol. 218: 262–268.
- Rey-Mansilla, M. M., Sotelo, C. G. and Perez-Martin, R. I. 2002. TMAOase activity of European hake (*Merluccius merluccius*) organs: influence of biological condition and season. J. Food Sci. 67: 3242–3251.
- Rey-Mansilla, M. M., Sotelo, C. G., Aubourg, S. P., Rehbein, H., Havemeister, W., Jorgensen, B. and Nielsen, M. K. 2001. Localization of formaldehyde production during frozen storage of European hake (*Merluccius merluccius*). Eur. Food Res. Technol. 213: 43–47.
- Rehbein, H. and Schreiber, W. 1984. TMAOase activity in tissues of fish species from the Northeast Atlantic. Comp. Biochem. Physiol. 79B: 447–452.
- Robinson, H. W. and Hodgen, C. G. 1940. The biuret reaction in the determination of serum protein. I. A study of the condition necessary for the production of the stable color which bears a quantitative relationship to the protein concentration. J. Biol. Chem. 135: 707–725.
- Rodger, G. and Hasting, R. 1984. Role of trimethylamine oxide in the freeze denaturation of fish muscle—is it simply a precursor of formaldehyde. J Food Sci. 49: 1640–1641.
- Sano, T., Noguchi, S. F., Tsuchiya, T. and Matsumoto, J. J. 1988. Dynamic viscoelastic behavior of natural actomyosin and myosin during thermal gelation. J. Food Sci. 53: 924–928.
- Saeed, S. and Howell, N. K. 2002. Effect of lipid oxidation and frozen storage on muscle proteins of Atlantic mackerel (*Scomber scombrus*). J. Sci. Food Agric. 82: 579–586.

- Saeed, S. and Howell, N. K. 2004. Rheological and differential scanning calorimetry studies on structural and textural changes in frozen Atlantic mackerel (*Scomber scombrus*). *J. Sci. Food Agric.* 84: 1216–1222.
- Saeed, S., Fawthrop, S. A. and Howell, N. K. 1999. Electron spin resonance (ESR) study on free radical transfer in fish lipid–protein interaction. *J. Sci. Food Agric.* 79: 1809–1816.
- Schubring, R. 1999. DSC studies on deep frozen fishery products. *Thermochimica Acta.* 337: 89–95.
- Shahidi, F. 1994. Seafood proteins and preparation of protein concentrates. In *Seafoods Chemistry, Processing Technology and Quality*. (Shahidi, F. and Botta, J. R., eds.). pp. 3–9. Chapman & Hall. Great Britain.
- Shenouda, S. Y. K. 1980. Theories of protein denaturation during frozen storage of fish flesh. In *Advance in Food Research*. (Chichester, C. O. ed.). pp. 275–311. Academic Press. New York.
- Shewfelt, R. L. 1981. Fish muscle lipolysis—A review. *J. Food Biochem.* 5: 79–100.
- Sikorski, Z. E. 1978. Protein changes in muscle foods due to freezing and frozen storage. *Int. J. Refrig.* 1: 173–180.
- Sikorski, Z. E. and Kolakowska, A. 1990. Freezing of marine food. In *Seafood: Resources, Nutritional Composition, and Preservation*. (Sikorski, Z. E., ed.). pp. 111–124. CRC Press, Inc. USA.
- Sikorski, Z. E. and Kostuch, S. 1982. Trimethylamine-N-oxide demethylase: its occurrence, properties, and role in technological changes in frozen fish. *Food Chem.* 9: 213–222.
- Sikorski, Z. E., Oley, J. and Kostuch, S. 1976. Protein changes in frozen fish. *Crit. Rev. Food Sci. Nutri.* 8: 97–129.
- Sikorski, Z. E., Kolokowski, A. and Burt, J. R. 1990. Postharvest biochemical and microbial changes. In *Seafood Resources Nutritional Composition and Preservation*. (Sikorski, Z. E., ed.). pp. 55–85. CRC Press, Inc. USA.
- Simeonidou, S., Govaris, A. and Vareltzis, K. 1997. Effect of frozen storage on the quality of whole fish and fillets of horse mackerel (*Trachurus trachurus*) and Mediterranean hake (*Merluccius mediterraneus*). *Z. Lebensm. Untersuch. Forsch.* 204: 405–410.

- Smith, L. A., Simmons, S. L., McKeith, F. K., Bechtel, P. L. and Brady, P. L. 1984. Effects of sodium tripolyphosphate on physical and sensory properties of beef and pork roasts. *J. Food Sci.* 49: 1636-1639.
- Sompongse, E., Itoh, Y. and Obataka, A. 1996. Effect of cryoprotectants and reducing reagent on the stability of actomyosin during ice storage. *Fish. Sci.* 62: 110-113.
- Sotelo, C. G. and Mackie, I. M. 1993. The effect of formaldehyde on the aggregation behavior of bovine serum albumin during storage in the frozen and unfrozen states in the presence and absence of cryoprotectants and other low molecular weight hydrophilic compounds. *Food Chem.* 47: 263-270.
- Sotelo, C. G. and Rehbein, H. 2000. TMAO-degrading enzymes. In *Seafood Enzymes: Utilization and Influence on Post Harvest Seafood Quality*. (Haard, N.F. and Simpson, B.K., eds.). pp. 167-190. Marcel Dekker. New York.
- Sotelo, G. C., Gallardo, J. M., Pineiro, C. and Perez-Martin, R. I. 1995a. Trimethylamine oxide and derived compounds, changes during frozen storage of hake (*Merluccius merluccius*). *Food Chem.* 53: 61-65.
- Sotelo, G. C., Pineiro, C. and Perez-Martin, R. I. 1995b. Denaturation of fish proteins during frozen storage: role of formaldehyde. *Z. Lebensm. Untersuch. Forsch.* 200: 14-23.
- Spinelli, J. and Koury, B. J. 1981. Some new observations on the pathways of formation of dimethylamine in fish muscle and liver. *J. Agric. Food Chem.* 29: 327-331.
- Srinivasan, S. and Hultin, H. O. 1997. Chemical, physical, and functional properties of cod proteins modified by a nonenzymic free-radical-generating system. *J. Agric. Food Chem.* 45: 310-320.
- Srinivasan, S., Xiong, Y. L. and Blanchard, S. P. 1997a. Effects of freezing and thawing methods and storage time on thermal properties of freshwater prawns (*Macrobrachium rosenbergii*). *J. Sci. Food Agric.* 75: 37-44.
- Srinivasan, S., Xiong, Y. L., Blanchard, S. P. and Tidwell, J. H. 1997b. Physicochemical changes in prawns (*Macrobrachium rosenbergii*) subjected to multiple freeze-thawed cycles. *J. Food Sci.* 67: 123-127.
- Stabursvik, E and Martens, H. 1980. Thermal denaturation of proteins in post rigor muscle tissue as studied by differential scanning calorimetry. *J. Sci. Food Agric.* 31: 1034-1042.

- Steel, R. G. D. and Torrie, J. H. 1980. *Principles and Procedures of Statistics: A Biometrical Approach*, 2nd ed. McGraw-Hill. New York.
- Sultanbawa, Y. and Li-Chan, E. C. Y. 2001. Structural changes in natural actomyosin and surimi from ling cod (*Ophiodon elongatus*) during frozen storage in the absence or presence of cryoprotectants. *J. Agric. Food Chem.* 49: 4716-4725.
- Suzuki, T. 1967. Freezing denaturation of fish proteins. *Refrigeration (Tokyo)*. 42: 46-51.
- Suzuki, T. 1981. *Protein Technology*. App. Sci. Publ. Ltd. London, UK.
- Takahashi, K., Inoue, N. and Shinano, H. 1993. Effect of storage temperature on freeze denaturation of carp myofibrils with KCl or NaCl. *Nippon Suisan Gakkaishi*. 59: 519-527.
- Tejada, M., Careche, M., Torrejon, P., Del Mazo, M. L., Solas, M. T., Garcia, M. L. and Barba, C. 1996. Protein extracts and aggregates forming in minced cod (*Gadus morhua*) during frozen storage. *J. Agric. Food Chem.* 44: 3308-3314.
- Tejada, M., Huidobro, A. and Mohamed, G. F. 2003. Comparison of gilthead sea bream (*Sparus aurata*) and hake (*Merluccius merluccius*) muscle proteins during iced and frozen storage. *J. Sci. Food Agric.* 83: 113-122.
- Tejada, M., Mohamed, G. F. and Huidobro, A. 2002. Addition of sardine to hake minces and subsequent effect on dimethylamine and formaldehyde formation. *J. Sci. Food Agric.* 82: 351-359.
- Thannhauser, T. W., Konishi, Y. and Scheraga, H. A. 1987. Analysis for disulfide bonds in peptides and proteins. *Methods. Enzymol.* 143: 115-118.
- Tironi, V. A., Lopez, L. B., Pellegrino, N., Anon, M. C. and Tomas, M. C. 2004. Malonaldehyde-induced microstructural modifications in myofibrillar proteins of sea salmon (*Pseudoperas semofasciata*). *J. Food Sci.* 69: 519-523.
- Tokunaga, T. 1964. Studies in the development of dimethylamine and formaldehyde in Alaska pollock muscle during frozen storage. *Bull. Hokk. Reg. Fish. Res. Lab.* 29: 108-114.
- Tokunaga, T. 1980. Biochemical and food scientific study on trimethylamine oxide and its related substances in marine fish. *Bull. Tokai. Reg. Fish Res. Lab.* 101: 1-5.
- Tokur, B., Ozkutuk, S., Atici, E., Ozyurt, G. and Ozyurt, C. E. 2006. Chemical and sensory quality changes of fish fingers made from mirror carp (*Cyprinus carpio* L., 1758) during frozen storage (-18°C). *Food Chem.* 99: 335-341.

- Tome, D., Kozlowski, A. and Mabon, F. 1985. Carbon-13 NMR study on the combination of formaldehyde with bovine serum albumin. *J. Agric. Food Chem.* 33: 449-455.
- Tomioka, K., Ogushi, J. and Endo, K. 1974. Studies on dimethylamine in foods II. Enzymatic formation of dimethylamine from trimethylamine oxide. *Bull. Jpn. Soc. Sci. Fish.* 40: 1021-1026.
- Tokunaga, T. 1970. Trimethylamine oxide and its decomposition in the bloody muscle of fish. II. Production of DMA and TMA during storage. *Bull. Jpn. Soc. Sci. Fish.* 36: 502-509.
- Torrejon, P., Del Mazo, M. L., Tejada, M. and Careche, M. 1999. Aggregation of minced hake during frozen storage. 209: 209-214.
- Tsuchiya, T., Tsuchiya, Y., Numura, Y. and Masumoto, J. J. 1975. Prevention of freeze denaturation of carp actomyosin by sodium glutamate. *J. Biochem.* 77: 853-856.
- Tu, A. T. 1982. *Raman spectroscopy in biology: Principles and applications*. New York: Wiley.
- Venugopal, V., Kakatkar, A., Bongirwar, D. R., Karthikeyan, M., Mathew, S. and Shamasundar, B. A. 2002. Gelation of shark meat under mild acidic conditions: physicochemical and rheological characterization of the gel. *J. Food Sci.* 67: 2681-2686.
- Wang, H., Liceaga-Gesualdo, A. M. and Li-Chan, E. C. Y. 2003. Biochemical and physicochemical characteristics of muscle and natural actomyosin isolated from young Atlantic salmon (*Salmo salar*) fillets stored at 0 and 4°C. *J. Food Sci.* 68: 784-789.
- Whistler, R. and Daniel, J. R. 1990. Functional of polysaccharides in foods. In *Food Additives* (Branen, A.R., Davidson, P.M. and Salminen, S., eds.). pp. 395-423. Marcel Dekker, Inc. New York.
- Wong, D. W. D. 1989. *Mechanism and Theory in Food Chemistry*. Van Nostrand Reinhold. New York.
- Yamada, K. and Amano, K. 1965. Studies on the biological formation of formaldehyde and dimethylamine in fish and shellfish. VII. Effect of methylene blue on the enzymatic formation of formaldehyde and dimethylamine from trimethylamine oxide. *Bull. Jpn. Soc. Sci. Fish.* 31: 1030-1037.

- Yasui, A. and Lim, P. Y. 1987. Changes in chemical and physical properties of lizardfish meat during iced and frozen storage. *Nippon Shok. Kyo. Gakkaishi.* 34: 54-60.
- Xiong, Y. L. 1997a. Protein denaturation and functionality losses. In *Quality in Frozen Food.* (Erickson, M.C. and Hung, Y.C., eds.) pp. 111-140. Chapman & Hall. New York.
- Xiong, X. L. 1997b. Structure-function relationships of muscle proteins. In *Food Proteins and Their Applications.* (Damodaran, S. and Paraf, A., eds.). pp. 341-392. Marcel Dekker, Inc. New York.
- Ziegler, G. R. and Acton, J. C. 1984. Mechanism of gel formation by proteins of muscle tissues. *Food Technol.* 38(5): 77-82.