ABSTRACTS

FRACTIONATION OF FATTY ACID ETHYL ESTERS USING SUPERCRITICAL FLUID CARBON DIOXIDE

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Preliminary evidence from several clinical studies has created an increasing demand for concentrates of omega-3 fatty acids, particularly eicosapentaenoic (EPA) and docasahexaenoic (DHA) acids. Fractionation of fatty acide ethyl esters derived from menhaden oil using supercritical fluid CO_2 has been found capable of producing EPA and DHA in purities as high as 95%. Factors affecting yield and production rates will be discussed.

SPATIAL PATTERNS OF ABUNDANCE FOR DEEP-WATER GOLDEN CRAB (*GERYON FENNERI*) AND RED CRAB (*G. QUINQUEDENS*) IN THE EASTERN GULF OF MEXICO

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Submersible transects and trap sampling confirmed concentrations of golden crabs (1) along intermediate depth contours, associated with rock outcroppings, and (2) off peninsular Florida rather than the northern Gulf. Red crabs were deeper and at northern as well as southern stations. Both species showed sex differences in distribution.

FEASIBILITY OF USING STRESS/STRAIN MEASUREMENTS FOR LEAST-COST FORMULATION OF SURIMI-BASED FOODS

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Measurement of stress and strain at failure, determined most appropriately for surimi-containing gels by a torsion test, is the quality control test for gel-forming ability recently recommended for industry adoption by the Technical Subcommittee of the Surimi Committee, National Fisheries Institute. The present work was conducted to determine the utility of such measurements for purposes of least-cost formulation. It was found that, although the effect of water addition alone on gel texture was somewhat unpredicatable, mixtures of surimis at the same moisture content formed gels in a fairly predictable (linear) manner. Stress/strain measurements were also shown to be more sensitive indicators of gelling quality than a least-concentration endpoint test.

SURIMI STUDIES ON WHITE HAKE (UROPHYCIS TENUIS)

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A series of studies underway at the Canadian Institute of Fisheries Technology (funded by Fisheries and Oceans Canada and N.S.E.R.C.) is examining the processing parameters and product performance associated with the use of selected Canadian Atlantic fish in the manufacturing of surimi. White hake is one of the targeted species and data will be presented on the effects of post-mortem age, use of frozen material, water washing regime, etc., on surimi quality.

EFFECT OF WASHING ON SOLUBLE PROTEIN CONTENT IN DARK AND ORDINARY MUSCLE TISSUES OBTAINED FROM ATLANTIC MENHADEN

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Proximate composition and protein distribution for excised Atlantic menhaden dark and ordinary muscle tissues were determined. Washing studies suggest high content of dark muscle in mince prior to leaching decreases removal efficiency of water soluble and will result in surimi of darker color and higher lipid and connective tissue content.

THE EFFECTS OF VARIOUS SALTS ON THE TEXTURAL AND CHEMICAL CHANGES IN FROZEN GADOID AND NON-GADOID FISH MINCES

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Freezing and frozen storage of gadoid fish minces causes textural changes. The effect of various salts (NaCl, NaI, NaSCN, NaAc, MgCL2 and CaC12) added to the fish prior to freezing were studied with respect to the texture and the water retention properties of fish muscle. When NaAc and NaCl were added to ocean perch and cod, the rate of textural toughness and expressible moisture decreased during frozen storage. On the other hand, NaI, NaSCN, CaC12, and MgC12 accelerated the textural toughness developed and increased the expressible moisture during frozen storage. SDS-PAGE showed that a crosslinked protein of 280,00 da occurs only with gadoid fish. For cod, 20 days at -7C are needed, whereas for whiting only 3 days are needed. Cod samples treated with NaSCN did not show this band. Ascorbic acid accelerated the time of appearance of the band, while fresh storage of cod for 10 days prior to freezing eliminated the band. Instron hardness seemed to increase in proportion to the development of the SDS-PAGE band.

RECENT PROGRESS IN THE DEVELOPMENT OF A RECEPTOR BASED BIOSENSOR FOR DECTECTION OF MAINE TOXINS

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One of the most innovative approaches for developing a detection method to screen seafood for the presence of natural toxins concerns engineering membrane channel protein receptors into field applicable detection devices. Such devices have the advantage of detecting several toxins with a single chip and are inexpensive. Maitotoxin, a putative agent in ciguatoxin disease, was investigated for physiological properties involving its calcium ionophoric characterists and its binding affinity to cortical synaptosomes. Resulting information is being applied to development of a capacitance, receptor based biosenor.

EXTENDING STORAGE LIFE OF FRESH TROPICAL FISH BY BLANCHING COMBINED WITH STORAGE IN ICE/SALT MIXTURES

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Fresh queen snapper (Etelis oculatus) and cardinal snapper (Pristipomoides marcrophtalmus) were treated by blanching in hot water at 90°C for 5 sec combined with storage in an ice/salt mixture at -3°C. Storage life of the two species in plain ice: 16.0 days for queen snapper and 15.8 days for cardinal snapper was extended to 30.8 and 35.5 days, respectively, in the treated fish. The combination of treatments also retarded the formation of spoilage compounds and microbial growth.
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EFFECTS OF PHOSPHATES, NACl, WATER CONTENT, AND PROCESS TEMPERATURES ON TEXTURE OF SURIMI GELS

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Selected phosphates were evaluated for their effect in altering the texture of gels prepared either primarily of surimi (Alaskan pollack, Theregra chalcugramma) or of surimi in combination with starch and other ingredients (commercial crab analog formulation). The latter formulations were systematically varied in NaCl and moisture content. Measurement techniques included differential scanning calorimetry, press moisture, torsional failure testing, and thermal scanning of rheological properties. Results indicate that phosphates had little effect on the textural properties of either pure surimi gels or those prepared by a commercial crabstick formulation at 3% or 2% NaCl contenct was reduced to 1%, phosphate had a significant effect in improving textural properites. Results also showed that water content could be appreciably increased without detriment to product texture by use of a pre-"set" incubation at 4°C for 16 hours prior to cooking.

EFFECT OF REDFEED CONTENT UPON THE FREQUENCY OF DEGRADATION OF SPAWNING FEMALE CAPLIN DURING STORAGE PRIOR TO FREEZING, DURING FROZEN STORAGE DURING THAWING

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Controlled experiments were conducted on commercially-caught caplin to determine the relationship between the level of redfeed content and the frequency of degradation of female caplin. Caplin were graded, following four different iced storage times, and three different frozen storage (-26°C)/thawing (+15°C) time combinations. Results of these experiments showed that the frequency of degradation was more affected by handling than by redfeed level.

PRODUCTION OF FISH HYDROLYSATES FOR AGRICULTURAL APPLICATIONS

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A process for fish hydrolysate production for fish processing wastes was developed using both formic acid and phosphoric acid as acidulants. A pilot scale production line was designed and installed in Gloucester, MA for low technology hydrolysate production from fish frames. Chemical analysis of the hydrolysates indicated that the resulting liquid fertilizer material using phosphoric acid had 1.6 - 2.4% nitrogen, 4 - 5% phophorous and 0.8 - 1.0% potassium. Additional micronutrients of interest included significant levels of magnesium, manganese, boron and zinc. Problems relating to production and stabilization are discussed.

EFFECTS OF FISH HYDROLYSATE ON GREENHOUSE GROWN CAPSICUM FRUTESCENS "JALAPENO"

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Fish hydrolysate (FH) made from Atlantic cod processing wastes, with an analysis of 1.6-4.2-0.8 (NPK) was compared to Peters 20-20-20 fertilizer on greenhouse grown "Jalapeno" peppers (Capsicum frutescens). These peppers were grown in Pro-Mix "BX" (PX), Metro-Mix #350 (MX) and top soil (TS) at 0, 80 and 160 ppm Nitrogen applied in weekly and bi-weekly intervals during June 9 to August 21, 1987. Compared to the Peters fertilizer applications, FH increased yeilds by 48 and 76% at 80 and 160 ppm respectively when used at a weekly rate. FH at 160 ppm applied bi-weekly, consistently increased yields by 123, 97 and 20% in PX, MX and TS respectively as compared to the Peters fertilizer applications. Overall, FH at 160 ppm increased yield by 50% compared to the Peters fertilizer applications.

PRELIMINARY REPORT ON APPLICABILITY OF COMMERCIAL MICRO KITS IN DETECTING FECAL COLIFORMS IN SEAFOODS

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Several seafoods were inoculated at two levels with 4 different Escherichia coli isolates and enumrated using standard MPN procedure as well as inoculating Petrifilm, Redigel, and Violet Red Bile (VRB) Agar which were incubate at 44.5°C. Discrepancies were detected between estimated level of inoculum and the MPN count. Petrifilm, Redigel, and VRB were observed to have limited accuracy at the non-acceptable contaimination level. VRB counts at 45°C tend to include coliforms, while Petrifilm can identify gas producing colonies and therefore provide a more reliable fecal coliform count.

MICROFLORA CHANGES IN POST-HARVEST SHELLSTOCK OYSTERS

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Changes in microflora were monitored during both commercial handling and controlled temperature storage of shellstock oysters. The effects of temperature and salinity of the harvest area and shell stock storage temperatures on fecal coliform and potentially pathogenic bacteria levels were investigated. Multiplication of fecal coliforms, including *E. coli*, was observed at temperatures above 10°C, but not at 10°C. Multiplication of some vibrios and *Aeromonas hydrophila* was also observed in shellstock oysters.

SKATE (*RAJA* SPP.) HANDLING, PROCESSING AND STORAGE CHARACTERISTICS

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Experiments in skate handling and processing included: (1) the relationship of weight of skate wings to size (weight, length and width) of whole skate; (2) fillet yields from skate wings; (3) processing methods and equipment; (4) iced storage time of skate wings, (5) various product forms; and (6), a frozen storage study which is still in progress. Discoloration of the wings was also investigated, but a satisfactory method of preventing this quality defect was not identified.

CALORIMETRIC DENATURATION KINETICS OF SURIMI AS AFFECTED BY SUGAR AND/OR SALT

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The kinetics of heat-induced denaturation and aggregation of surimi proteins, as affected by additional of sugar and/or salt, were investigated by differential scanning calorimetry (DSC). Net enthalpic changes were always endothermic in nature, and of a greater magnitude at lower heating rates led to a gel structure in which potential bondings were more completely accomplished; that is, a more energetically favorable structure was attained with slow heating. The stablization of proteins by sugar, and destabilization of proteins by salt, were also measured calorimetrically.

BIOMEDICAL TEST MATERIALS FROM MENHADEN OIL

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Using chemical and physical separation techniques, the Charleston Laboratory is producing quality-assured biomedical test materials from menhaden oil for use in NIH-approved research. Over time, these materials will included not only refined oil and n-3 ester concentrates, but also n-3 enriched glycerides, purified EPA and DHA.

FISHFAX: A COMPUTERIZED INFORMATION SYSTEM

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With the coming of age of computerized information systems, vast amounts of information and data on almost any topic can be examined, read, and printed using a personal computer in almost any location. The National Seafood Inspection Laboratory (NSIL) has developed one such system - FISHFAX. FISHFAX contains information on a species specific basis, covering such topics as biological profiles, processing methods, nutritional values, economic considerations, and public health information. All information and data contained within FISHFAX has been previously published. This information is verified, summarized, and quality assured before being entered into the information base. A poster presentation demonstrates FISHFAX using a personal computer.

PROGRESS IN THE DEVELOPMENT OF MONOCLONAL ANTIBODIES TO SEMI-PURIFIED MAITOTOXIN EXTRACTS FROM *GAMBIERDISCUS TOXICUS*

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Maitotoxin, a water soluble toxin produced by the dinoflagellate *Gambierdiscus toxicus*, is thought to be associated with the development of ciguatoxicity in tropical marine reef fishes. Spleen cells from BALC/C mice immunized with semi-purified maitotoxin extracts were fused with myeloma cells to produce hybridoma cells using standard somatic cell fusion technology. Five separate cell fusion experiments have resulted in the development of 31 hybridoma cells lines which secrete monoclonal antibodies reactive with various components in the maitotoxin extracts. Specificity experiments using an indirect ELISA assay have identified certain monoclonal antibodies which appear to be reactive with various pigments present in the maitotoxin extracts. Other monoclonal antibodies react in direct proportion to measured toxicity regardless of maitotoxin extract pigmentation, suggesting that they are reacting with the actual toxin molecule or a closely related component. Several monoclonal antibodies have shown detectable reaction with maitotoxin extract at toxicity levels as low as 0.002 mouse units. Further characterization experiments still need to be carried out to determine the antigenic determinants recognized by these monoclonal antibodies.

ILLUMINATION STUDIES FOR IMPROVED INSPECTION SYSTEMS FOR DETECTION OF PHOCANEMA

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Many segments of the food industry are currently using or investigating the uses of various automated inspection systems to measure quality characteristics or for the detection of defects. The problem of Phocanema within the fishing industry has long been a serious concern and this study deals with the investigation of a machine vision system for the detection of this parasite. Very early in this investigation it was found that the choice of the lighting scheme to illuminate the cod worm is still a critical aspect of the total machine vision system. Details of the lighting systems which result in the highest contrast between fish tissue and the cod worm are presented as well as quality considerations of some systems.