SRI LANKA STANDARD 1005 : 1993

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CODE OF HYGIENIC PRACTICE FOR

THE PRODUCTS OF AQUACULTURE

SRI LANKA STANDARDS INSTITUTION

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SLS 1005 : 1993

Gr. 18

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Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

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SRI LANKA STANDARD
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FOREWORD

This standard was finalized by the Sectoral Commitee on Fish and Fishery Products and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1993-12-26.

This standard is an adoption of Codex Alimentarius Commission Recommended Draft International Code of Hygienic Practice for the products of aquaculture. The text of this code was considered suitable for adoption as a Sri Lanka Standard without major changes.

This covers essential hygienic factors from site selection for an aquaculture establishment to the final phase of live fish production covering harvesting, inspection and loading for delivery.

During the formulation of this Code due consideration has been given to the relevant provisions made under the Sri Lanka Food Act No. 26 of 1980 and the regulations framed thereunder.

1 SCOPE

1.1 This Code applies to finfish and crustaceans produced by commercial aquaculture and intended eventually for direct human consumption. It contains general guidelines for setting up and conducting production under most essential requirements of hygiene up to harvesting live fish and loading for transport to market. The slaughtering process is not considered.

1.2 The variations in aquaculture systems and practices are too numerous to justify an attempt to identify the specifications of any system or fish species or region. However, it can provide a basis for establishing Codes for individual species or aquaculture methods which may have more narrow specific requirements relating to hygiene.

2 REFERENCES

SLS 143 General principles of food hygiene
SLS 614 Potable water

3 DEFINITIONS

For the purpose of this code the following definitions should apply :

3.1 **accepted** : Accepted by the official agency having jurisdiction;

3.2 **adequate** : Sufficient to accomplish the intended purpose of this Code;

3.3 **approved for human consumption** : Fish that has been inspected and passed for human consumption without any restriction, and certified accordingly.

3.4 **aquaculture** : Production of live finfish or of crustaceans (fish) for human consumption in freshwater, brackish or marine establishments; it includes all production phases from spawning and reproduction to the loading of the final product which has been harvested from the rearing unit into adequate transport to market.

3.5 **aquaculture establishment** : Any premises for the production of live finfish or crustaceans intended for human consumption, including the supporting inner infrastructure and surroundings under the control of the same management.

3.6 **boxing** : The Loading of fish at the harvesting site into boxes for the purpose of transport outside the establishment.

3.7 **certificate** : An official document of the controlling authority issued by an authorized inspector for the purpose of attesting the quality of the fish at the time and site of its departure from the aquaculture establishment.

3.8 **chemicals** : Any substance either natural or synthetic which can affect the live fish, its pathogens, the water, equipment used for production or the land within the aquaculture establishment; such substances include pesticides, therapeutic chemicals, disinfectants, anaesthetics, hormones, dyes, detergents, antifoulants, and fertilizers.

3.9 **chilled water** : Potable water reduced in temperature by mechanical refrigeration or by the addition of ice made from potable water.

3.10 **chilled sea water** : Clean sea water reduced in temperature by the addition of ice prepared from potable water or from clean sea water or by another acceptable method.

3.11 **chilling** : The process of cooling the aquaculture product thoroughly to a temperature approaching that of melting ice.

3.12 **clean sea water** : Sea water which meets the same microbiological standards as potable water and is free of objectionable substances.

3.13 **cleaning** : The physical removal of soil, dirt, fish food residues or other objectionable matter from surfaces, including the surfaces of live and fresh fish.

3.14 **colouring** : Obtaining specifically coloured fish by addition to fish food of a natural or artificial dye approved for this purpose by the agency having jurisdiction.

3.15 **conditioning** : Transferring harvested fish which are fit for human consumption into other ponds, tanks or cages of the same aquaculture establishment, in order to clean the gut, recover from stress or acclimatize to different conditions before transport of the live product.

3.16 **contamination** : The presence of any objectionable matter on or in fish.

3.17 **controlling authority** : The official authority or authorities charged by the government with the control of fish hygiene as well as/or with sanitation in aquaculture (the official agency having jurisdiction).

3.18 **depuration** : (see 3.42)

3.19 **detained** : Under the control of the controlling authority pending final judgement.

3.20 **diseased or defective** : A fish on or in which pathological changes or other abnormalities are apparent.

3.21 **disinfection** : The application of hygienically satisfactory physical and/or chemical agents and processes to cleaned surfaces, drained aquaculture premises, eggs or fish with the intention of eliminating or reducing the number of microorganisms to a level that will not lead to harmful contamination of human food or to carrier state and/or disease of fish.

3.22 **establishment** : (see 3.5)

3.23 **equipment** : Utensils such as nets, conveyers, sorting tables or machines,buckets, dip nets, pumps, transportation tanks, vehicles, etc.,used during fishing out, sorting, loading and transportation of fish to market.

3.24 **farm gate sales** : Selling of inspected live or fresh fish fit for human consumption at an approved location within the aquaculture establishment to individuals.

3.25 **fish** : Any of the coldblooded aquatic vertebrate animals commonly known as such. This includes Teleosts and Elasmobranchs. For the purpose of this Code, the term covers finfish (teleosts) and crustaceans. Other finfish (elasmobranchs), molluscs, other invertebrates, aquatic mammals, amphibians and reptiles are not covered.

3.26 **fish food** : Fodder intended for fish in aquaculture establishments, in any form and of any composition.

3.27 **fish food additives** : Chemicals other than nutrients for fish which are approved for addition to fish food.

3.28 **fish hygiene** : Measures in aquaculture to ensure good health and well being of fish in an aquaculture establishment.

3.29 **fishing out** : Collecting or harvesting of fish out of rearing units for their transfer to another rearing unit.

3.30 **fit for transport** : Live fish certified by an inspector to be epizootically harmless for natural and cultured populations of fish in other areas; such certification is based on the epizootical evaluation of both the aquaculture establishment, the means, route and destination of transportation and further manipulation of the fish.

3.31 **food hygiene** : Comprises conditions and measures necessary for the production, processing, storage and distribution of fish designed to ensure a safe, sound wholesome product fit for human consumption.

3.32 **fresh fish** : Freshly harvested fish which have received no preserving treatment or which have been preserved only by chilling.

3.33 **growing area** : Freshwater, estuarine, brackish and marine areas used for aquaculture establishments, including surroundings under the control of the same management.

3.34 **harvesting** : Operations which starts with taking the fish from the water and ends with the transport of live or fresh fish for human consumption to the market.

3.35 **inspector** : A properly trained officer appointed by the controlling authority of the country for the purpose of inspection of aquaculture establishments and/or products as well as control of fish hygiene and/or hygiene and sanitation in aquaculture.

3.36 **manager** : In relation to an establishment includes any person for the time being responsible for the management of the establishment.

3.37 **packaging material** : Any container or material for transport of fresh fish which is approved by the official agency having jurisdiction.

3.38 **pesticide** : Any substance intended for preventing, destroying attracting, repelling or controlling any pest including unwanted species of plants or animals during the production, storage, transport, distribution and processing of food, agricultural commodities, or animal feeds or which may be administered to animals for the control of ectoparasites. The term normally excludes fertilizers, plant and animal nutrients, food additives, and veterinary drugs.

3.39 **pesticide residue** : Any specified substance in food, agricultural commodities, or animal feed resulting from the use of a pesticide. The term includes any derivatives of a pesticide, such as conversion products, metabolites, reaction products, and impurities,

3.40 **pollutants** : Substances originating from outside or within the aquaculture establishment, which can contaminate the fish or impair the quality of the water in which they are grown.

3.41 **potable water** : Water of such chemical and bacterial quality that it is wholesome and fit for human consumption.

3.42 **purification** : The holding of live initially contaminated fish for a period of time under officially approved and supervised conditions thereby rendering fish fit for human consumption without further treatment.

3.43 **rearing environment** : The water space in which fish are confined for the purpose of aquaculture by any construction material.

3.44 **rearing unit in an aquaculture establishment:** An adequate aqueous confinement space for a certain biomass; this term includes a pond, storage pond, tank, raceway, cage, etc.

3.45 **refrigeratged sea water** : Clean sea water cooled by a suitable refrigeration system. Its salt content is normally about 3 percent.

3.46 **residues** : Any foreign substances including their metabolites, which remain in fish prior to harvesting as a result of either application or accidental exposure. Examples of such substances are antibiotics, anthelminthics, chemotherapeutics, disinfectants, fish food additives, growth promoters, hormones, hormone-like substances; heavy metals, pesticides, tranquilizers and radioactive materials. Maximum residue limits (MRLs) are specified for many substances by the Codex Alimentarius or national regulations.

3.47 **restricted distribution** : A term used in relation to protection of fish health. It applies to fish which, although fit for human consumption, may cause the spread of serious fish pathogens to certain areas free of those pathogens; their destinations are therefore restricted by the authorized inspector.

3.48 **sanitation in aquaculture** : Protecting the health of fish, including eliminating or reducing the number of bioagressors capable of causing diseases and/or increased the mortality rate of fish in the establishment.

3.49 **suitable corrosion-resistant material** : Impervious material which is free from pits, crevices, and scale, is non-toxic and unaffected by water (or seawater), ice, slime or any other corrosive substance with which it is likely to come into contact. Its surfaces must be smooth and it must be capable of withstanding exposure to repeated cleaning, including the use of detergents and disinfectants.

3.50 **tolerance** : Refers to residue levels of a chemical that are permitted by the official agency having jurisdiction in food for human consumption.

3.51 **unit** : (see 3.44)

3.52 **veterinary drug** : Any substance applied or administered to any food-producing animal, such as meat or milk-producing animals, poultry, fish or bees, whether used for therapeutic, prophylactic or diagnostic purposes or for modification of physiological functions or behaviour.

3.53 **whole fish** : Individual fish as harvested.

3.54 **wastewater** : Treated human wastes which meet recommended guidelines for safe use of human wastes in aquaculture as stipulated by the World Health Organization and the national agency having jurisdiction.

3.55 **withdrawal time and withholding time** : The period of time between the last administration of a veterinary drug, or exposure to a chemical, that ensures the contents of residues in food comply with the maximum residue limit for this veterinary drug (MRLVD).

4 AQUACULTURE ESTABLISHMENTS: GENERAL CONSIDERATIONS

4.1 Phases of aquaculture production

4.1.1 DEPENDING ON SPECIES, TECHNOLOGY AND CLIMATE, THE PRODUCTION CYCLE FROM BROODFISH TO THE FISH SIZE OR SIZES FOR HUMAN CONSUMPTION ARE USUALLY DIVIDED INTO AN APPROPRIATE NUMBER OF PHASES. THESE PHASES SHOULD BE CARRIED OUT IN SPECIFIC REARING UNITS TO ENSURE THE TECHNOLOGICAL AND HYGIENIC QUALITY AT EACH STAGE OF LIFE.

4.1.2 THE GROW-OUT PHASE, WHICH PRODUCES THE FISH SIZE FOR HUMAN CONSUMPTION, SHOULD RECEIVE PARTICULAR ATTENTION BY THE OFFICIAL AGENCY HAVING JURISDICTION FOR HYGIENE.

The carry-over of possible hygienic risks from previous phases to the grow-out phase is reduced with item and weight gain of fish.

4.1.3 STORAGE AND PURIFICATION OF LIVE FISH AFTER HARVESTING REQUIRES SPECIAL HYGIENIC ATTENTION

Where and when necessary, these operations should be carried out in separate units after harvesting. Good conditions for the fish, water quality and avoidance of use of the veterinary drugs, pesticides or other chemicals should be the main concern in these operations.

4.1.4 BROODFISH WHICH ARE REJECTED FOR BREEDING PURPOSES AND ARE DESIGNATED FOR HUMAN CONSUMPTION SHOULD SATISFY THE SAME HYGIENIC QUALITY REQUIREMENTS AS PRODUCTION FISH

The quantity of sorted-out broodfish in aquaculture establishments is small, availability is seasonal and the consumption usually local.

4.2 Systems and technologies of production

4.2.1 HYGIENIC QUALITY OF FISH IN ANY SYSTEM OR TECHNOLOGY OF PRODUCTION, SHOULD BE ASSURED BY AN APPROPRIATE SURROUNDING ENVIRONMENT OF THE ESTABLISHMENT AND HYGIENIC PRACTICES IN OPERATION

4.3 Intended consumption forms

4.3.1 FISH INTENDED FOR CONSUMPTION IN RAW FORM SHOULD BE PRODUCED UNDER CONDITIONS SPECIFICALLY DESIGNED TO PREVENT OR ELIMINATE CONTAMINATION WITH HUMAN PATHOGENS

Location of establishments or units for purification on a high quality water source and other precautions should be accompanied by an adequate monitoring programme.

4.3.2 FISH WHICH WILL BE COOKED SHOULD SATISFY THE NORMAL HYGIENIC SAFETY REQUIREMENTS

4.3.3 FISH FOR ANY FORM OF CONSUMPTION SHOULD SATISFY ESTABLISHED CRITERIA FOR THE LEVELS OF RESIDUES, CONTAMINANTS, BIOTOXINS AND OFF FLAVOURS

5 AQUACULTURE ESTABLISHMENTS : LOCATION, LAYOUT AND CONSTRUCTION

5.1 Site selection - General considerations

Fish should not be grown or harvested where the presence of harmful substances would lead to an unacceptable level of such substances. Establishments should preferably be sited at a safe distance from sources of water contamination. The water should be of adequate quality for the species and life stage to be reared and the available surface area should be adequate.

5.1.1 *Land-based establishments*

5.1.1.1 THE ESTABLISHMENT SHOULD BE LOCATED ON A WATER SOURCE WHICH SATISFIES THE HYGIENIC CRITERIA FOR THE PRODUCTION OF LIVE FISH

The official agency having jurisdiction may or may not lay down specific water quality standards.

5.1.1.2 THE WATER SOURCE SHOULD BE OF ADEQUATE QUALITY FOR THE SPECIES AND LIFE STAGE OF FISH TO BE REARED AS WELL AS FOR THE ANTICIPATED SYSTEM AND TECHNOLOGY OF REARING; PRETREATMENT OF WATER CAN BE USED FOR ADJUSTMENT OF QUALITY

One of the factors determining both the profitability of production and the hygienic acceptability of fish is its health. Chemical and biological characteristics of the water should therefore be matched with the physiological requirements of fish. Under some circumstances the pretreatment of recycled water is also acceptable.

5.1.1.3 THE QUANTITY OF WATER AVAILABLE TO THE ESTABLISHMENT SHOULD BE SUFFICIENT; IT SHOULD BE UTILIZED IN A RATIONAL WAY WHICH WILL ENSURE THE ACCEPTABLE HYGIENIC QUALITY OF THE END PRODUCT AND ADEQUATE CONDITIONS FOR PRODUCTION

5.1.1.4 ESTABLISHMENTS SHOULD PREFERABLY BE LOCATED IN AREAS WHERE REARING UNITS AND AUXILIARY FACILITIES CAN BE PROTECTED FROM FLOODING BY ADEQUATE LAYOUT AND CONSTRUCTION

5.1.1.5 THE IMMEDIATE VICINITY OF ESTABLISHMENTS MUST BE FREE OF POTENTIAL SOURCES OF WATER CONTAMINATION

Locations close to industry or mining, especially if they lie on the same watershed, as well as small locations for stillwater establishments within large fields for plant crops may be exposed to risks from unexpected chemical contamination which can lead also to fish kills. Locations close to densely populated areas or downstream from concentrations of animal husbandry or close to hospitals may be exposed to risks of microbiological contamination.

5.1.1.6 ROADWAYS AND RAILROADS IN THE VICINITY OF THE SITE SHOULD HAVE ADEQUATE DRAINAGE WHICH SHOULD PREFERABLY NOT BE DIRECTLY CONNECTED WITH THE WATER.

5.1.1.7 SOIL FOR THE CONSTRUCTION OF EARTHEN PONDS SHOULD NOT CONTAIN SUCH CONCENTRATIONS OF HEAVY METALS OF CHEMICALS WHICH MAY LEAD TO THE ACCUMULATION OF UNACCEPTABLE LEVELS OF CONTAMINATION IN FISH

Before building an aquaculture establishment a survey of the water source and soil should be conducted in order to determine the concentration and extent of fluctuations of selected parameters which are of importance for the hygienic quality of end products. The decision on which parameters should be measured as well as what should be the schedule and duration of the survey will depend on the local situation concerning the potential contaminants and the availability of previous data.

5.1.1.8 IN SOME CIRCUMSTANCES TREATED WASTEWATER MAY BE USED FOR THE PRODUCTION OF FISH AT EARLY LIFE STAGES (FRY, FINGERLINGS) WHICH WILL BE SUBSEQUENTLY TRANSFERRED TO A GROW-OUT PHASE, ACCORDING TO PROCEDURES ACCEPTABLE TO THE OFFICIAL AGENCY HAVING JURISDICTION

There are risks associated with the use of treated wastewater which are recognized in the guidelines prepared by WHO*. Wherever possible the use of such treated waste should be reserved for the early life stages, bearing in mind that the early life stages are relatively more susceptible to contamination.

5.1.2 *Water-based establishments*

5.1.2.1 FRESHWATER, BRACKISH WATER OR SEABASED PLATFORMS, CAGES, PENS AND ENCLOSURES SHOULD BE SITED ON A WATER SYSTEM OF SATISFACTORY HYGIENIC QUALITY

5.1.2.2 TO THE EXTENT POSSIBLE EXPOSURE OF IMMEDIATE VICINITY TO WATER-BORNE TRAFFIC SHOULD BE AVOIDED BY SITE SELECTION AND PREVENTED BY ADEQUATE MEASURES

5.1.2.3 THE SURFACE, DEPTH AND WATER MOVEMENTS IN THE AREA OF AN ESTABLISHMENT SHOULD BE DETERMINED IN ORDER TO ADJUST THE SIZE AND TECHNOLOGY OF THE PRODUCTION TO HYGIENIC REQUIREMENTS

5.1.2.4 THE ESTABLISHMENT SHOULD HAVE A LAND BASED UNIT PROVIDING THE HYGIENIC CONDITIONS FOR TRANSFER OF INPUTS TO BOAT TRANSPORT AND FOR LANDING OF FISH

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* *World Health Organization (WHO), 1989. WHO's Health Guidelines for the use of Wastewater in agriculture and Aquaculture (WHO Technical Report Series 788).*

Mara, D. and S. Cairncross eds. 1989 Guidelines for the safe use of wastewater and excreta in agriculture and aquaculture. Measures for public health protection. WHO/UNEP. Geneva, 187p.

5.2 Layout and construction

5.2.1 *General considerations*

5.2.1.1 ESTABLISHMENTS SHOULD BE LAID OUT, DESIGNED AND CONSTRUCTED TO FACILITATE HYGIENIC OPERATIONS BY MEANS OF A REGULATED FLOW IN THEIR PROCESS FROM THE ARRIVAL OF INPUTS, THEIR USE IN PRODUCTION UNITS TO HARVESTING, LOADING AND TRANSPORT OF FISH

5.2.1.2 WHERE APPROPRIATE, ESTABLISHMENTS OR PARTS THEREOF SHOULD BE SO DESIGNED THAT ACCESS CAN BE CONTROLLED

It is desirable to prevent general access to the public and in some circumstances, such as for purposes of quarantine, this must be rigidly enforced.

5.2.1.3 ROADWAYS AND AREAS SERVING THE ESTABLISHMENT WHICH ARE WITHIN ITS BOUNDARIES SHOULD HAVE A SURFACE SUITABLE FOR WHEELED TRAFFIC. THERE SHOULD BE ADEQUATE DRAINAGE WHICH SHOULD NOT END UP IN THE WATER SUPPLY FOR THE ESTABLISHMENT OR IN REARING UNITS

5.2.1.4 BOATS AND PORTS FOR WATER-BASED ESTABLISHMENTS SHOULD ALLOW EASY AND EFFICIENT LOADING AND UNLOADING OF INPUTS

5.2.1.5 UNITS FOR FISH REARING, FACILITIES AND BUILDINGS SHOULD BE OF SOUND CONSTRUCTION AND MAINTAINED IN GOOD REPAIR. ALL CONSTRUCTION MATERIALS SHOULD BE SUCH AS NOT TO TRANSMIT ANY UNDESIRABLE SUBSTANCES OR PATHOGENS TO FISH.

Adequate working space should be provided to allow satisfactory performance of all operations. Layout and design should be such as to permit easy and adequate cleaning and to facilitate the proper supervision of hygienic operations.

5.2.2 *Outdoor rearing units on land*

5.2.2.1 UNITS FOR FISH REARING SHOULD BE DESIGNED AND CONSTRUCTED TO PROVIDE HYGIENIC CONDITIONS FOR THE INTENDED TECHNOLOGY AND OPERATIONS

Physical characteristics of each rearing unit for confinement of fish (ponds, raceways, tanks, canals, cages, etc.) should be matched with physiological characteristics and requirements of species and age category as well as with the planned methods and technology of production.

5.2.2.2 WATER INLETS AND OUTLETS SHOULD ALLOW DEPENDABLE CONTROL OF FLOW RATES OF WATER LEVEL AND OF DESIRABLE TYPE OF WATER MOVEMENTS, IF APPLICABLE

5.2.2.3 DRAINING BY GRAVITY OR PUMPING SHOULD FACILITATE COMPLETE HARVESTING AND ENABLE HYGIENIC PROCEDURES, SUCH AS CLEANING, DRYING DISINFECTION AND MUD REMOVAL OR OXIDATION, TO BE UNDERTAKEN

Other means are required for control of the fish population and of hygiene in undrainable earthen ponds or tanks.

5.2.2.4 DESIGN AND CONSTRUCTION SHOULD SECURE EFFICIENT, SIMPLE, HYGIENIC AND CONTROLLABLE APPLICATION OF INPUT SUCH AS FISH STOCK, FEED, FERTILIZERS AND CHEMICALS

5.2.2.5 HARVESTING AREAS SHOULD BE DESIGNED AND CONSTRUCTED FOR EASY, FAST AND HYGIENICALLY ACCEPTABLE OPERATIONS, INCLUDING, WHEN APPLICABLE, SORTING, GRADING, SLAUGHTER, LOADING OF VEHICLES AND INSPECTION

Physical injuries, weakening, excessive stress or contamination of fish should be avoided. Proper mechanization of the process should be encouraged and space should be foreseen for its use.

5.2.2.6 WHERE APPLICABLE, CONSTRUCTION SHOULD ENSURE THE HUMANE PREVENTION OF PREDATION ALTERNATIVELY SUITABLE EQUIPMENT SHOULD BE INSTALLED

5.2.2.7 EFFLUENT WATER FROM AQUACULTURE ESTABLISHMENTS SHOULD BE TREATED TO ENSURE THAT IT MEETS THE GUIDELINES OR STANDARDS OF THE OFFICIAL AGENCY HAVING JURISDICTION

5.2.3 *Rearing establishments and units on water*

Parts of 5.2.2 should be adopted where applicable.

5.2.3.1 MESHES ON CAGES, PENS AND OTHER FISH CONFINEMENT UNITS SHOULD BE OF ADEQUATE SIZE TO ALLOW SUFFICIENT WATER EXCHANGE FOR THE MAINTENANCE OF HYGIENIC CONDITIONS IN THE REARING SPACE

Fish size, mesh size, unit size and water exchange with the surroundings by currents and fish movements should be considered in this regard.

5.2.3.2 SURFACES ABOVE THE WATER LEVEL SHOULD BE DESIGNED AND CONSTRUCTED FOR SAFE, EASY, EFFICIENT AND HYGIENIC WORK AND HANDLING OF INPUTS AND FISH

These considerations also apply to boats or moveable platforms.

5.2.3.3 THE STORAGE SPACE FOR FEED AND/OR EQUIPMENT AND UTENSILS AS WELL AS SHELTER OR HOUSING FOR MANPOWER SHOULD MEET THE SAME HYGIENIC REQUIREMENTS AS FOR SUCH PREMISES ON LAND BASED ESTABLISHMENTS

5.2.3.4 DIFFERENT AGE GROUPS OR BATCHES OF FISH SHOULD BE REARED IN THE SPACE-SEPARATED UNITS OR PARTS OF THE ESTABLISHMENTS

5.2.3.5 THE ACCESS BY BOAT SHOULD BE SAFE; BOATS AND UNITS SHOULD HAVE MATCHING CHARACTERISTICS FOR SAFE UNLOADING, LOADING AND TRANSPORTATION

5.2.4 *Indoor and sheltered units for rearing*

5.2.4.1 SUCH UNITS SHOULD BE DESIGNED TO ALLOW EFFICIENT AND HYGIENIC OPERATIONS

5.2.4.2 SEPARATION OF OPERATING AREAS BY PARTITIONS OR OTHER EFFECTIVE MEANS, REGULATED FLOW OF FISH AND INPUTS IN THE PROCESS AND THE SEPARATION OF AUXILIARY ROOMS SHOULD ENSURE EFFECTIVE AND HYGIENIC OPERATIONS

5.2.4.3 IN INDOOR AND SHELTERED AREAS:

FLOORS - WHERE APPROPRIATE, SHOULD BE OF WATERPROOF, NON-ABSORBENT, WASHABLE, AND NON-SLIP MATERIALS, WITHOUT CREVICES, AND SHOULD BE EASY TO CLEAN AND DISINFECT. WHERE APPROPRIATE, FLOORS SHOULD SLOPE SUFFICIENTLY FOR LIQUIDS TO DRAIN TO TRAPPED OUTLETS.

WALLS - WHERE APPROPRIATE, SHOULD BE OF WATERPROOF, NON-ABSORBENT AND WASHABLE MATERIALS SEALED AND FREE OF CREVICES WHICH COULD HARBOUR INSECTS AND SHOULD BE LIGHT-COLOURED. UP TO A HEIGHT APPROPRIATE TO THE OPERATION, THEY SHOULD BE SMOOTH AND WITHOUT CREVICES, AND SHOULD BE EASY TO CLEAN AND DISINFECT. WHERE APPROPRIATE, ANGLES BETWEEN WALLS, BETWEEN WALLS AND FLOORS AND BETWEEN WALLS AND CEILINGS SHOULD BE SEALED AND COVERED TO FACILITATE CLEANING

CEILINGS - SHOULD BE SO DESIGNED, CONSTRUCTED AND FINISHED AS TO PREVENT THE ACCUMULATION OF DIRT AND MINIMIZE CONDENSATION, MOULD DEVELOPMENT AND FLAKING AND SHOULD BE EASY TO CLEAN.

WINDOWS - AND OTHER OPENINGS SHOULD BE SO CONSTRUCTED AS TO AVOID ACCUMULATION OF DIRT AND THOSE WHICH OPEN SHOULD BE FITTED WITH INSECT-PROOF SCREENS. SCREENS SHOULD BE EASILY MOVABLE FOR CLEANING AND KEPT IN GOOD REPAIR. INTERNAL WINDOW SILLS, IF PRESENT, SHOULD BE SLOPED TO PREVENT USE AS SHELVES

APPROPRIATE, BE SELF-CLOSING AND CLOSE FITTING

STAIRS, LIFT CAGES AND AUXILIARY STRUCTURES SUCH AS PLATFORMS, LADDERS, CHUTES, SHOULD BE SO SITUATED AND CONSTRUCTED AS NOT TO CAUSE CONTAMINATION TO FISH. CHUTES SHOULD BE CONSTRUCTED WITH INSPECTION AND CLEANING HATCHES.

OVERHEAD STRUCTURES AND FITTINGS, WHERE APPROPRIATE, SHOULD BE INSTALLED IN SUCH A MANNER AS TO AVOID CONTAMINATION DIRECTLY OR INDIRECTLY OF CLEANING OPERATIONS. THEY SHOULD BE INSTALLED WHERE APPROPRIATE AND BE SO DESIGNED AND FINISHED AS TO PREVENT THE ACCUMULATION OF DIRT AND MINIMIZE CONDENSATION, MOULD DEVELOPMENT AND FLAKING. THEY SHOULD BE EASY TO CLEAN. ITEMS SUCH AS WOOD, SHOULD BE AVOIDED UNLESS ITS USE WOULD CLEARLY NOT BE A SOURCE OF CONTAMINATION. IF IT IS NECESSARY TO USE WOOD IT SHOULD NOT BE TREATED WITH TOXIC PRESERVATIVES.

5.2.4.4 LIVING QUARTERS, TOILETS AND AREAS WHERE ANIMALS ARE KEPT SHOULD BE COMPLETELY SEPARATED FROM AND SHOULD NOT OPEN DIRECTLY ON TO FISH REARING AND HANDLING AREAS

5.2.5 *Purification units*

5.2.5.1 WHERE OFF-FLAVOURS OR MICROBIOLOGICAL CONTAMINATION MIGHT CAUSE TEMPORARY UNACCEPTABILITY OF END PRODUCTS, SEPARATE UNITS OR ADEQUATE LOCATIONS FOR PURIFICATION SHOULD BE AVAILABLE

Units or locations for purification (depuration) should have a hygienically acceptable water supply of an adequate quantity for providing optimum conditions for such operation and the quantity of fish. For the land based units, a constant flow of water is necessary, layout and construction of such units (or selection of location) should be carried out in accordance with the guidelines of the official agency having jurisdiction.

5.2.6 *Equipment and utensils*

5.2.6.1 ALL EQUIPMENT AND UTENSILS FOR HARVESTING, CATCHING, SORTING, GRADING, CONVEYING AND TRANSPORTING OF FISH USED ON THE ESTABLISHMENT SHOULD BE DESIGNED FOR RAPID AND EFFICIENT HANDLING OF LIVE FISH WITHOUT CAUSING MECHANICAL DAMAGE, AND WITH MINIMUM STRESS, SHOULD BE SUITABLE FOR EASY AND THOROUGH CLEANING AS WELL AS DISINFECTION, WHEN APPLICABLE, AND SHOULD NOT CAUSE CONTAMINATION. STATIONARY EQUIPMENT SHOULD BE INSTALLED IN SUCH A MANNER AS TO PERMIT EASY ACCESS AND CLEANING

5.2.6.2 ALL NETS FOR FISH SUCH AS SEINES AND OTHER NET UTENSILS MADE FROM NET FOR HANDLING FISH SHOULD HAVE A MESH SIZE AND BE OF QUALITY WHICH PREVENTS SNAGGING, HANGING OR OTHER PHYSICAL INJURY TO FISH. THEY SHOULD BE EASY TO CLEAN AND, IF NECESSARY, TO DISINFECT.

5.2.6.3 CONVEYING EQUIPMENT FOR LIVE AND SLAUGHTERED FISH SHOULD BE CONSTRUCTED OF SUITABLE CORROSION-RESISTANT MATERIAL WHICH DOES NOT TRANSMIT TOXIC SUBSTANCES; SHOULD BE EASY TO CLEAN AND SHOULD NOT CAUSE MECHANICAL INJURIES TO FISH. IT SHOULD BE FITTED WITH CHUTES OF SUFFICIENT LENGTH FOR SLIDING OF FISH ONTO HARD SURFACES WITHOUT A SUDDEN DROP OF MORE THAN 0.5 METRE OR INTO WATER WITHOUT A DROP OF MORE THAN 1 METRE.

5.2.6.4 TABLES AND OTHER EQUIPMENT USED FOR SORTING, GRADING AND COUNTING OF FISH SHOULD BE OF SUITABLE SMOOTH, IMPERVIOUS, NON-TOXIC AND CORROSION-RESISTANT MATERIAL DESIGNED FOR RAPID AND EFFICIENT HANDLING OF FISH WITHOUT OR WITH MINIMUM INJURY, AND FOR THOROUGH CLEANING AS WELL AS FOR DISINFECTION, IF NECESSARY.

5.2.6.5 ALL TUBES, BARRELS, TANKS AND OTHER CONTAINERS USED FOR HANDLING AND CONVEYING OF LIVE FISH SHOULD BE OF SMOOTH, CORROSION-RESISTANT AND NON-TOXIC MATERIAL WHICH IS EASY TO CLEAN. IF USED FOR FISH WITHOUT WATER, THEIR LOAD SHOULD BE RESTRICTED TO A QUANTITY WHICH WILL NOT CAUSE EXCESSIVE PRESSURE ON THE LOWEST SPECIMENS.

5.2.6.6 TANKS FOR TRANSPORTATION OF LIVE FISH IN WATER WITHIN AND OUTSIDE OF ESTABLISHMENTS SHOULD BE CONSTRUCTED OF CORROSION-RESISTANT MATERIAL AND EASY TO CLEAN AS WELL AS TO DISINFECT, IF NECESSARY. THEIR DESIGN SHOULD SECURE EASY LOADING AND FAST, EASY AND COMPLETE UNLOADING OF LIVE FISH VIA AN ADEQUATE CHUTE. SUCH HANDLING SHOULD NOT CAUSE INJURIES TO FISH.

To prevent mortality or deterioration of hygienic quality it should be possible to fit tanks with equipment to provide uniform oxygenation of the water. To prevent physical damage tanks should also be designed so that when filled the residual airspace is a minimum.

5.2.6.7 EQUIPMENT AND CONVEYANCES FOR LOADING, UNLOADING AND TRANSPORTING OF FEED, INORGANIC AND ORGANIC FERTILIZERS WITHIN THE ESTABLISHMENT, AS WELL AS FOR DISTRIBUTION OF THESE INPUTS IN REARING UNITS SHOULD BE DESIGNED FOR HYGIENIC, EASY, FAST AND SAFE OPERATION AS WELL AS FOR THOROUGH CLEANING AND DISINFECTION, WHEN NECESSARY. THEY SHOULD BE CONSTRUCTED OF SMOOTH, IMPERVIOUS, CORROSION-RESISTANT MATERIAL AND SHOULD BE EASY TO CLEAN.

5.2.6.8 PROPER FACILITIES FOR WASHING AND DISINFECTION OF EQUIPMENT AND UTENSILS SHOULD BE PROVIDED.

Facilities should be present in every establishment for cleaning of vehicles, equipment and utensils. Such facilities should be located at a specifically designed area where there is an adequate supply of hot and cold water or sea water of adequate quality under good pressure and where there is proper drainage. It should be equipped with water hoses, spray nozzles, brushes, scrapers and other suitable washing and sanitizing equipment. Detergents and disinfectants should be suitable for the purpose intended and should be acceptable to the official agency having jurisdication. Any residues of these agents on a surface which may come in contact with fish should be removed by thorough rinsing with water.

5.2.6.9 ALL EQUIPMENT AND UTENSILS SHOULD BE PROPERLY IDENTIFIED ACCORDING TO THE CATEGORY OF INTENDED USE: FOR FISH, FOR INPUTS, FOR WASTE. CONTAINERS IDENTIFIED FOR INPUTS AND WASTE SHOULD NOT BE USED FOR THE FISH

5.2.7 *Handling and disposal of waste*

5.2.7.1 LAYOUT AND CONSTRUCTION SHOULD SECURE SAFE COLLECTION, CONVEYING, TRANSPORT AND STORAGE OF UNFIT INPUTS AND OF FISH UNFIT FOR HUMAN CONSUMPTION, AS WELL AS THEIR SAFE UTILIZATION OR DISPOSAL WITHIN OR OUTSIDE THE ESTABLISHMENT

5.2.7.2 MARKED CONTAINERS FOR UNFIT INPUTS AND FISH SHOULD BE LEAKPROOF, CONSTRUCTED OF METAL OR OTHER IMPERVIOUS MATERIAL WHICH SHOULD BE EASY TO CLEAN OR DISPOSABLE, AND DESIGNED TO BE CLOSED SECURELY.

5.2.7.3 ACCESS TO WASTE BY PESTS SHOULD BE PREVENTED

5.2.7.4 PROCESSES AND FACILITIES FOR HANDLING WASTE SHOULD PREVENT CONTAMINATION OF FISH, INPUTS, WATER, OTHER EQUIPMENT, BUILDINGS AND ROADWAYS ON ESTABLISHMENT

5.2.7.5 WASTE WHICH IS FIT FOR HYGIENICALLY ACCEPTABLE PROCESSING SHOULD BE UTILIZED ACCORDINGLY.

5.2.7.6 WASTE WHICH CANNOT BE MADE FIT BY FURTHER PROCESSING SHOULD BE DISPOSED OF IN SUCH A FACILITY AND IN SUCH A MANNER AS TO AVOID CONTAMINATION OF THE ESTABLISHMENT AND/OR OTHER FOOD MATERIALS

5.2.7.7 WASTE FISH, SLAUGHTER OFFAL AND BLOOD WATER SHOULD BE COLLECTED AND TREATED TO ENSURE THAT THEY DO NOT CAUSE CROSS-INFECTION

5.3 Sanitary requirements

5.3.1 *Facilities for personnel*

5.3.1.1 ADEQUATE, SUITABLE AND CONVENIENTLY LOCATED CHANGING FACILITIES AND TOILETS SHOULD BE PROVIDED IN ESTABLISHMENTS

5.3.1.2 IN LAND-BASED ESTABLISHMENTS COVERING A SMALL TO MEDIUM SIZE AREA, ALL TOILETS SHOULD BE ON ONE LOCATION, IN AN ADEQUATE BUILDING OR PART OF A BUILDING

Toilets should be so designed as to ensure hygienic removal of waste matter. These areas should be well lit, ventilated and where appropriate heated and should not open directly to fish production or handling areas. Where hot and cold water are available, mixing taps should be provided. Where paper towels are used, a sufficient number of dispensers and receptacles should be provided near to each washing facility. Taps of a non-hand operable type are desirable. Notices should be posted directing personnel to wash their hands after using the toilet.

The following formula could be used as a guideline in assessing the adequacy of toilet facilities in relation to the number of employees:

01	to 9	employees	- 1 toilet
10	to 24	employees	- 2 toilets
25	to 49	employees	- 3 toilets
50	to 100	employees	- 5 toilets
For every 30 employees over 100			- 1 toilet,

NOTE : Sex ratio among employees should be taken into account when assessing the adequacy of toilets.

Urinals may be substituted for toilets but only to the extent of one-third total toilets required for men.

5.3.1.3 PLUMBING AND THE MATTER OF WASTE DISPOSAL SHOULD BE APPROVED BY THE OFFICIAL AGENCY HAVING JURISDICTION

5.3.1.4 ON LAND-BASED ESTABLISHMENTS COVERING A LARGE AREA AND WITH OUTPOSTED PERSONNEL, CONVENIENTLY LOCATED, ADEQUATELY DESIGNED AND CONSTRUCTED FIELD TOILETS SHOULD BE PROVIDED

The design, construction and use of such toilets should follow the WHO recommendations for rural latrines and satisfy hygienic requirements.

They should be provided with a reservoir of potable water and hand washing facilities. The plumbing and the matter of waste treatment and disposal should be approved by the official agency having jurisdiction.

5.3.1.5 WATER BASED ESTABLISHMENTS OR UNITS OF ESTABLISHMENTS WITH OUTPOSTED DETACHED PERSONNEL SHOULD BE PROVIDED WITH ADEQUATE TOILETS AND HAND WASHING FACILITIES. SUCH INSTALLATIONS SHOULD BE DESIGNED AND CONSTRUCTED IN A MANNER WHICH WILL PREVENT THE CONTAMINATION OF WATER IN FISH REARING UNITS.

This may imply the use of storage tanks.

5.4 Hygienic operating requirements

5.4.1 REARING UNITS, STORAGE BUILDINGS AND BUILDINGS FOR OTHER PURPOSES, EQUIPMENT, UTENSILS AND ALL OTHER PHYSICAL FACILITIES SHOULD BE MAINTAINED IN GOOD REPAIR AND IN AN ORDERLY CONDITION.

5.4.2 TANKS, NETS, SORTING AND OTHER EQUIPMENT AND UTENSILS FOR LIVE FISH HANDLING AND TRANSPORTATION SHOULD BE THOROUGHLY CLEANED AFTER EACH CYCLE OF USE AND DISINFECTED, WHEN APPROPRIATE

5.4.3 CLEANING AND DISINFECTION PROCEDURES FOR EQUIPMENT AND UTENSILS SHOULD BE EFFECTIVE; THEY SHOULD BE CARRIED OUT AT APPROPRIATE LOCATION AND IN SUCH A MANNER AS TO PRESENT NO HAZARD TO FARMED FISH, END PRODUCTS AND TO HUMAN HEALTH

Cleaning and disinfection should be carried out in accordance with the procedures outlined in SLS 143 and adjusted to local conditions and needs.

Cleaning agents and disinfectants should meet the requirements of the official agency having jurisdiction.

Agents for cleaning and disinfection should be prepared in accordance with the manufacturer's recommendations. Special attention should be paid to the temperature, salinity and acidity or alkalinity of the solution, concentration of the active ingredient, presence of other chemicals, mode of application and kind of surface or type of soil (dirt) to be treated. These are some of the factors which will determine the usefulness of the agent. Different agents should be combined only if it has been established that they are compatible.

5.4.4 AREAS FOR HARVESTING END PRODUCTS, EQUIPMENT AND UTENSILS FOR FISHING OUT AND TRANSPORT OF FISH TO THE MARKET SHOULD BE INSPECTED BEFORE THE PROCESS BEGINS TO ENSURE THAT THEY HAVE BEEN PROPERLY CLEANED, DISINFECTED AND RINSED.

5.4.5 REMOVAL OF DIRT, SLIME AND OTHER WASTES FROM EQUIPMENT AND UTENSILS DURING FISHING OUT OPERATIONS SHOULD BE ON A CONTINUOUS OR NEAR CONTINUOUS BASIS

5.4.6 ALL PESTICIDES, SUCH AS RODENTICIDES, INSECTICIDES, HERBICIDES, FUMIGANTS OR OTHER HARMFUL SUBSTANCES SHOULD BE APPROVED FOR THE USE INTENDED BY THE OFFICIAL AGENCY HAVING JURISDICTION

5.4.7 HAZARDOUS SUBSTANCES (PESTICIDES, VETERINARY DRUGS, DISINFECTANTS AND OTHER CHEMICALS) SHOULD BE STORED IN LOCKED ROOMS OR CABINETS USED ONLY FOR THAT PURPOSE

Only authorized and properly trained persons or persons under strict supervision of trained personnel should handle and apply pesticides or other substances which may represent a hazard to health or to the hygiene of fish in rearing units or result in unacceptably high residue levels in the fish when marketed.

5.4.8 DOGS, CATS AND OTHER ANIMALS SHOULD BE EXCLUDED FROM THE HARVESTING AND LOADING AREA DURING OPERATION

5.4.9 AREAS FOR UNLOADING FISH FEED AT REARING UNITS AND PLACES WHERE FISH ARE FED SHOULD BE KEPT CLEAN TO AVOID ATTRACTION OF BIRDS, RODENTS, INSECTS AND OTHER ANIMALS AS WELL AS TO PREVENT SPOILAGE OF FEED.

Storage areas for fish feed should be effectively protected against the entrance of insects, rodents, birds and other vermin.

5.4.10 ANY CONTAINERS FOR TRANSPORT OF FISH FEED AND FOR FEEDING SHOULD BE KEPT TIGHTLY CLOSED AND PROTECTED FROM PROLONGED EXPOSURE TO FACTORS THAT MIGHT CAUSE SPOILAGE.

5.5 Personnel hygiene and health requirements

5.5.1 MANAGERS OF ESTABLISHMENTS SHOULD ARRANGE FOR ADEQUATE AND CONTINUOUS TRAINING OF FISH HANDLING PERSONNEL IN HYGIENIC PRODUCTION PRACTICES SO THAT THEY UNDERSTAND THE PRECAUTIONS NECESSARY TO PREVENT CONTAMINATION OF FISH.

INSTRUCTION SHOULD INCLUDE THE RELEVANT PARTS OF THE SLS 143.

5.5.2 A PERSON WHO IS KNOWN TO BE SUFFERING FROM, OR WHO IS A CARRIER OF A COMMUNICABLE DISEASE OR HAS AN INFECTED WOUND OR OPEN LESION SHOULD NOT BE EMPLOYED WHERE THEY CAN CAUSE A HEALTH HAZARD

The management should require that any person afflicted with infected wounds, sores, diarrhoea or any illness should report to the management. Management should not allow any person known to be affected with a disease, or while afflicted with infected wounds, sores or diarrhoea, to work in any area of an establishment in which there is a likelihood of such a person contaminating fish or fish feed with disease - causing microorganisms.

5.5.3 **ANY PERSON WHO HAS A CUT OR WOUND SHOULD NOT CONTINUE TO HANDLE FISH FEED OR FISH CONTACT SURFACES UNTIL THE INJURY IS COMPLETELY PROTECTED.**

Adequate first-aid facilities should be provided at working stations and an employee trained in hygiene and first aid should be available. Injuries should be protected by a water-proof covering which is firmly secured and which is conspicuous in colour.

5.5.4 **PERSONS SHOULD WEAR SUITABLE PROTECTIVE CLOTHING CONSISTENT WITH THE NATURE OF WORK**

6 QUALITY AND SAFE USE OF INPUTS

6.1 General requirements

6.1.1 **ESTABLISHMENTS SHOULD PROCURE AND ACCEPT ONLY SUCH RAW MATERIALS WHICH DO NOT CONTAIN EXCESSIVE LEVELS OF ANY POTENTIAL CONTAMINANT**

The concentration of microorganisms, parasites or toxic, decomposed or extraneous substances or pesticides, heavy metal and other chemical residues in raw materials should not exceed safe levels. To be considered as safe, the concentration of these organisms and substances should not be damaging to the health of reared fish and should not cause and unacceptable presence or concentration of contaminants in end products.

6.1.2 **RAW MATERIALS SHOULD BE INSPECTED PRIOR TO USE**

The inspection at acceptance should include checking of accompanying documentation, of labelling and of status of the consignment. Where appropriate or necessary, samples for laboratory tests should be taken by an appropriate method. In some countries a recommended sampling plan must be followed and it is useful to freeze and store feed samples for subsequent investigation if problems arise.

6.1.3 RAW MATERIALS AND INGREDIENTS SHOULD BE PROPERLY STORED AND MAINTAINED

Conditions in storage premises of the establishment should prevent spoilage, protect aganist contamination and minimize damage to materials and ingredients. Such stocks should be rotated and used prior to the expiry of their shelf life.

6.1.4 DIRECT OR INDIRECT CONTAMINATION OF END PRODUCTS BY RAW MATERIALS SHOULD BE PREVENTED.

Persons handling raw materials or other inputs which are capable of contaminating fish at harvesting for marketing should not be take part in the latter operation unless and until they have discarded the previously worn protective clothing, have changed into clean protective clothing and have thoroughly washed their hands.

All equipment which has been in contact with raw materials or contaminated material should be thoroughly cleaned and disinfected prior to being used for contact during fishing-out operations of end products.

6.1.5 FISH PRODUCTION SHOULD BE SUPERVISED BY SUITABLE TRAINED AND EXPERIENCED PERSONNEL

Supervision of all phases, steps and operations in the production process should ensure the adherence to good production practices during the whole technological procedure on the establishment, including maintenance of adequate conditions for living and growth of fish, protection of fish health, proper and careful handling of live fish, proper handling and application of fish feed and of other inputs, as well as the observation of regulations and instructions for the use of veterinary drugs, pesticides and other chemicals.

The goal of the supervision should be to secure good performance in production under conditions which will prevent the possibility of contamination of fish and assure high quality of end products.

6.1.6 PERMANENT, LEGIBLE AND DATED RECORDS AND PERTINENT PRODUCTION DETAILS SHOULD BE KEPT FOR EACH REARING UNIT AND ESTABLISHMENT

Records should encompass all data which give a significant insight into the actual course of rearing in each production cycle. They should follow a uniform format suitable for the production method, technology and establishment. Separate records should be kept on administration of veterinary drugs, fertilization, use of pesticides and other chemicals, application of sewage and manure, daily water temperature, daily fish mortality, results of harvesting, storage of live fish, purification, sampling, results of laboratory examinations,

and on shipments. All such records should be kept for a minimum of two years. Since analysis of such data can help to improve technology, production and quality, it is advisable to keep them for longer periods of time. The use of a computerized data base will assist record keeping.

6.2 Water quality management and control

PERSONS CARRYING OUT VISUAL INSPECTION OF WATER SHOULD BE ADEQUATELY TRAINED SO THAT THEY CAN UNDERSTAND THE NECESSITY OF PRECAUTIONS AND SIGNIFICANCE OF ACCIDENTAL CONTAMINATION. IN ADDITION TO VISUAL OBSERVATIONS, WATER QUALITY SHOULD BE SAMPLED AND ANALYZED BY ADEQUATE PROCEDURES TO DETECT CONTAMINATION

A regular programme of sampling and examination of water quality should be set up in accordance with the degree and type of risk. Establishments should be equipped for simple field water quality analysis and should have access to an approved laboratory for detection and qualification of microbial, parasitic and chemical contamination of water.

6.2.1 *Water entering the land based establishments*

6.2.1.1 THE QUALITY AND QUANTITY OF WATER ENTERING THE ESTABLISHMENTS USED FOR FISH REARING SHOULD BE CAREFULLY CONTROLLED IN ORDER TO PREVENT DISRUPTION OR DAMAGE IN PRODUCTION AND RISK TO THE HYGIENIC QUALITY OF FISH

The frequency and type of supervision of the water for fish rearing, at the point of entrance into the establishment, should depend upon the type of water source as well as on the extent and type of contamination hazards in the upstream part of the watershed.

6.2.1.2 THE SUPPLY OF SPRING, WELL OR SIMILAR WATER SOURCE BY GRAVITY SHOULD BE INSPECTED VISUALLY ON A DAILY BASIS

Spring, well and other underground water sources are generally of stable composition and properties, but their quantity may oscillate seasonally.

Any changes of quantity, colour, transparency or odour in the water supply are usually easily noted and should be reported to the manager. Samples for microbiological and chemical examination of water should be taken regularly.

6.2.1.3 WATER SUPPLY BY GRAVITY FROM LARGE OPEN WATER BODIES SHOULD BE INSPECTED VISUALLY SEVERAL TIMES A DAY

Large watersheds providing water of satisfactory quality may be contaminated accidentally. Severe chemical pollution may be accompanied by an acute fish-kill in such waters.

Persons controlling water intake or intakes should immediately notify the manager about any unusual or sudden changes in water quality or quantity or about a fish kill.

The manger should notify the official agency having jurisdiction about any suspected contamination, secure adequate water sampling and suspend water intake, if applicable.

The official agency having jurisdiction should immediately inform the manager about any case of water pollution in an upstream area.

6.2.1.4 WATER UPTAKE BY PUMPING SHOULD BE CONSTANTLY SUPERVISED OR MONITORED BY AN ADEQUATE SYSTEM OF AUTOMATIC CONTROL IN ORDER TO PREVENT BREAKDOWN OF WATER SUPPLY OF CONTAMINATION BY FUEL

6.2.2 *Water based establishments*

6.2.2.1 WATER ENTERING PRODUCTION AREAS SHOULD NOT HAVE BEEN EXPOSED TO POLLUTANTS WHICH CAN IMPAIR FISH HEALTH AND/OR CAUSE HYGIENIC UNACCEPTABILITY OF END PRODUCTS.

Risks of fish contamination by inadequate water quality in surroundings of growing areas are negligible in offshore rearing. Inland and coastal locations might become contaminated by onshore activities or by activities on water. Establishments should be protected from pollution.

6.2.2.2 RISKS OF CONTAMINATION SHOULD BE REGULARLY, FREQUENTLY AND APPROPRIATELY SURVEYED. SHORELINES AND WATER NEAR ESTABLISHMENT AREAS SHOULD BE INCLUDED IN SUCH SURVEYS

6.2.3 *Wastewater use and integrated aquaculture*

6.2.3.1 MICROBIOLOGICAL QUALITY AND THE USE OF TREATED WASTEWATER FROM WASTE STABILIZATION PONDS FOR REARING OF FINFISH IN PONDS UNDER CONDITIONS OF WARM CLIMATES SHOULD COMPLY WITH THE TENTATIVE GUIDELINES OF WHO*

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* *World Health Organization (WHO), 1989 WHO's Health Guidelines for the use of Wastewater in Agriculture and Aquaculture (WHO Technical Report Series 788)*

Mara, d. and S. Cairncross eds. 1989. Guidelines for the safe use of wastewater and excreta in agriculture and aquaculture, WHO/UNEP, Geneva

Abstraction of water from rivers and other water bodies receiving wastewater occurs throughout the world. Such abstraction also serves aquaclture but water quality must be closely monitored.

Increased attention is being paid to a few large scale aquaculture operations based on wastewater. Although incomplete, the existing epidemiological data suggest that with certain precautions such production can be not only beneficial environmentally, socially and economically, but also safe for human health. However, more data are needed before faster expansion of this practice can be generally recommended. The WHO reports must be carefully studied before such systems are introduced.

6.3 Inorganic fertilizers

6.3.1 INORGANIC FERTILIZERS FOR SUPPLEMENTATION OF NUTRIENTS (ELEMENTS SUCH AS NITROGEN, PHOSPHORUS, POTASSIUM AND CALCIUM) SHOULD BE ADEQUATE FOR STILL WATER FISH PRODUCTION, SAFE AND OF APPROVED QUALITY

Maximum concentration of potentially contaminating and accumulating chemicals particularly heavy metals in fertilizers should be acceptable to the official agency having jurisdiction. Industrially produced fertilizers should be of approved quality.

6.3.2 FERTILIZERS IN UNDAMAGED SACKS CAN BE STORED OFF GROUND, FOR SHORT PERIODS ON POND BANKS; A DRY LOCATION AND A PLASTIC COVER SHOULD PROTECT THE FERTILIZER FROM RAIN. LONGER STORAGE SHOULD BE CARRIED OUT IN A PERMANENT-ROOFED STORAGE FACILITY

6.3.3 COMPOSITION OF NUTRIENTS AND FORM OF NUTRIENT SALTS IN FERTILIZERS AS WELL AS DOSAGE, METHOD AND TIMING OF FERTILIZATION SHOULD MATCH THE ACTUAL NEED OF A TECHNOLOGY IN ORDER TO AVOID POSSIBLE OVERDOSAGE AND DAMAGE TO THE REARING ENVIRONMENT, FISH HEALTH AND ITS QUALITY

Appropriate fertilization should increase natural food abundance in stillwater ponds and provide better growth of fish biomass under extensive or semi-intensive rearing conditions. However, under certain conditions, and especially in semi-intensive methods, fertilization may be unnecessary or even counterproductive. If applied in such situations, excessive fertilization can cause algal blooms with consequent increased decomposition and accumulation of organic matter on the bottom. Economic loss, stress to fish and off-flavour in fish might occur.

6.4 Organic fertilizers

6.4.1 **FERTILIZERS OF NATURAL ORIGIN SHOULD ONLY BE USED TO SUPPLEMENT THE PONDS WITH NUTRIENT MINERALS AND CARBON IF THEY DO NOT COMPROMISE THE HYGIENIC QUALITY OF THE FISH FROM AN EPIDEMIOLOGICAL, MICROBIOLOGICAL OR PARASITOLOGICAL STANDPOINT**

Composted plant materials and offal, animal manure, stable drainage, slaughterhouse waste, nightsoil, excreta-derived sludge and seepage, as well as municipal sewage can efficiently increase fish production in ponds. Applicability of these inputs depends upon local socio-economic conditions, availability, cost of their labour-intensive use and on hygienic safety for persons engaged in handling, as well as upon the public at large.

Organic fertilizers of plant origin do not pose direct risks for the hygienic quality of fish.

6.4.2 **WHEN APPLYING PROPERLY COMPOSTED ORGANIC FERTILIZERS OF ANIMAL OR HUMAN ORIGIN TO PONDS FOR THE EARLY LIFE STAGES OF FISH, CROSS CONTAMINATION OF FISH IN THE END PHASE OF PRODUCTION SHOULD BE AVOIDED.**

6.4.3 **APPLICATION OF ADEQUATELY COMPOSTED MANURE OF ANIMAL OR OF HUMAN ORIGIN TO PONDS FOR THE END PHASE OF PRODUCTION SHOULD BE STOPPED AT LEAST THREE WEEKS PRIOR TO HARVESTING. HARVESTED PRODUCTS SHOULD BE MARKETED IN CIRCUMSTANCES WHERE FISH PREPARATION INCLUDES THOROUGH COOKING**

Technically correct treatment of excreta for sufficient time will inactivate viruses, bacteria and eggs of parasites significant for public health. Tentative procedures for treatment and the quality criteria for organic fertilizers of human origin are given by WHO (see 6.2.3.1).

6.4.4 **ORGANIC FERTILIZERS FROM MUNICIPAL WASTE TREATMENT AND FROM OTHER SOURCES USED FOR FISH CULTURE SHOULD BE FREE OF CHEMICALS WHICH MIGHT BE HARMFUL TO FISH AND WHICH CAN DIRECTLY OR INDIRECTLY ACCUMULATE IN FISH IN CONCENTRATIONS WHICH RENDER THE FISH UNACCEPTABLE.**

6.4.5 **SHORT-TERM STORAGE OF READY-TO-USE FERTILIZERS OF PLANT AND ANIMAL ORIGIN AT THE ESTABLISHMENTS SHOULD BE CARRIED OUT IN A DECENTRALIZED MANNER. STORED FERTILIZERS SHOULD BE PROTECTED FROM BIRDS AND OTHER ANIMALS IN A MANNER WHICH WILL MINIMIZE THE ATTRACTION OF INSECTS.**

Such fertilizers should be unloaded and kept in a heap at the rearing unit where they will be used within approximately one week. A larger supply should not be kept on establishment or at individual rearing units. Heaps should have a minimum of surface area and be covered securely by a leak-proof plastic cover.

During rain the runoff water from the heap should be directed into the pond for which the heap is intended. Such runoff should not enter other units or water supply lines on the establishment.

6.4.6 DOSAGE, FREQUENCY AND TIMING OF FERTILIZATION SHOULD BE ADJUSTED TO OVERALL TECHNOLOGY AND SHOULD NOT CAUSE DETERIORATION OF POND ENVIRONMENT, AFFECT THE HEALTH OF FISH OR ITS HYGIENIC QUALITY

6.5 Feeds and feeding

6.5.1 FEEDS AND FEEDING PRACTICE SHOULD ENSURE GOOD GROWTH, GOOD HEALTH AND ACCEPTABLE HYGIENIC QUALITY OF FISH

Depending on species, age, rearing systems and conditions, the nutritional requirements of fish for good growth and healt ih can be met either by natural food which should be made available by proper technology in the rearing unit, or by a mixture of natural and added (supplemental) feed, or by a complete diet.

Feeds which completely satisfy the nutritional requirements of fish are produced either industrially or at the establishment by mixing of ingredients and other components in accordance with the formulation. Most supplemental feeds consists of a single ingredient, providing mainly energy, and are often of local origin.

The quality of feed depends upon the source, as well as upon storage and handling conditions at the establishment. Feed should not normally contain veterinary drugs.

6.5.2 INDUSTRIALLY PRODUCED COMPLETE FEEDS AND INDUSTRIALLY PRODUCED FEED INGREDIENTS SHOULD BE PROPERLY LABELLED; THEIR COMPOSITION MUST FIT THE DECLARATION ON THE LABEL AND THEY SHOULD BE HYGIENICALLY ACCEPTABLE.

On arrival at the establishment, the feeds and feed ingredients produced industrially should meet hygienic and other requirements of the agency having jurisdiction. Labels on feed should be checked and the stated date of expiry be noted.

6.5.3 RAW AGRICULTURAL PRODUCTS FOR SUPPLEMENTAL FEEDING CAN, AS FAR AS NUTRITIONAL VALUE IS CONCERNED, BE OF INFERIOR QUALITY GRADE, BUT THEY SHOULD BE HYGIENICALLY SAFE.

Unacceptable levels of pesticide residues or of mycotoxins should be the main concern for the hygienic quality of raw agricultural products, such as grains, linseed, sorghum or other locally available feed for supplemental feeding. Use of vegetable ingredients or of feed containing raw substances toxic or harmful to fish (enzyme inhibitors, etc.) should not be practised.

6.5.4 MOIST FEED OR FEED INGREDIENTS SHOULD BE FRESH AND OF ADEQUATE CHEMICAL AND MICROBIOLOGICAL QUALITY

Fresh or frozen fish, fish silage, offal from fish or animal slaughter and rejects from animal slaughter houses should reach the establishment in an adequate state of freshness. Decomposing moist feed can cause stress and diseases in fish and endanger its quality. Rejects from animal slaughter houses must be sterilized by an approved procedure prior to acceptance. It is advisable to pasteurize fresh or frozen fish prior to use or mixing into moist ratios.

6.5.5 UPON ARRIVAL, FEED AND FEED INGREDIENTS SHOULD BE EITHER PROMPTLY UTILIZED OR ADEQUATELY STORED TO PREVENT THEIR DETERIORATION OR CONTAMINATION. STORAGE ARRANGEMENTS AND CAPACITIES SHOULD BE ADJUSTED TO THE NEEDS OF ESTABLISHMENT

Fresh moist feed of animal origin, as well as freshly prepared moist feed, can be stored for a short time under refrigeration or stored for longer time by freezing. Refrigeration and/or freezing and defrosting facilities should be of adequate design and construction.

Industrially prepared moist feed pellets should be used immediately or be stored frozen in sacks at about-20°C to maintain nutritional quality. Such material should be thoroughly defrosted before use and then fed immediately.

Fresh vegetable feed, such as grasses and leguminous crops, should be fed to fish immediately.

Dry feed ingredients and supplements should have an adequately low moisture content if stored. They should be stored in adequate buildings or solid constructions under conditions which provide ventilation and protection from high temperature, moisture and light, as well as from birds, insects, rodents and vermin.

Formulated pelleted feed in bulk should be stored in dry, cool, well ventilated conditions. Feeds or the feed ingredients in sacks (bags) should be stored in adequate buildings. Bags should be of acceptable material, preferably doubled walled and resistant to moisture, transport and handling. Accidentally damaged sacks should be used first.

6.5.6 FEED WHICH IS COMPOUNDED INDUSTRIALLY OR AT THE ESTABLISHMENT SHOULD CONTAIN ONLY SUCH ADDITIVES, GROWTH PROMOTING SUBSTANCES, FISH FLESH COLOURING AGENTS OR VETERINARY DRUGS WHICH ARE PERMITTED FOR FISH BY THE OFFICIAL AGENCY HAVING JURISDICTION.

6.5.7 ESTABLISHMENTS PREPARING THEIR OWN MOIST FEED SHOULD HAVE A FACILITY LOCATED IN A BUILDING DESIGNED ESPECIALLY FOR THIS PURPOSE. THE FACILITY AND EQUIPMENT SHOULD BE THOROUGHLY CLEANED AFTER EACH CYCLE OF FOOD PREPARATION. THE FACILITY SHOULD BE PROTECTED FROM THE ENTRANCE OF INSECTS, RODENTS, OTHER PESTS AND ANIMALS.

6.5.8 FORM OF FEED, ITS SIZE AND OTHER PROPERTIES AS WELL AS THE FEEDING REGIME SHOULD BE ADJUSTED TO THE NEEDS OF SPECIES, TO SIZE, WATER TEMPERATURE AND TECHNOLOGY IN ORDER TO AVOID THE LOSS OF FEED IN REARING UNITS WITH CONSEQUENT WATER QUALITY DETERIORATION AND THREAT TO FISH QUALITY.

Feed uneaten by fish will decompose in the rearing unit and can cause water quality deterioration, resulting in capacity reduction, as well as in threats to the health and hygienic quality of fish.

6.6 Veterinary drugs

6.6.1 REGISTRATION AND DISTRIBUTION - GENERAL REQUIREMENTS

All medicinal productions for example, all veterinary therapeutic products and medicinal premixes for inclusion in fish feeds should comply with the OIE Code of Practice for the Registration of Veterinary Drugs and be registered with the national authority. Products should only be distributed through veterinarians, registered wholesalers, pharmacists or other retail outlets permitted by national laws and regulations. Storage and transport conditions must conform to the specifications on the label, in particular those concerning temperature, humidity, light, etc.

6.6.2 RESPONSIBILITY OF THE VETERINARIAN AND OF OTHERS AUTHORIZED TO HANDLE OR ADMINISTER MEDICINES - GENERAL PROVISIONS

Whenever veterinary drugs are handled or administered it is important to recognize that potentially hazardous effects may occur in fish, in human operators and/or the environment. When the adminstration of a medicine is not under direct veterinary supervision, it is therefore essential that after the diagnosis, clear instructions should be provided on dose and methods of use, taking account of the competence of the user to perform the work and ensuring that the correct calculation of, and the importance of adhering to withdrawal periods is fully understood. It is similarly important to ensure that the facilities and management systems employed enable the withdrawal periods to be observed.

6.6.3 HANDLING AND ADMINISTRATION - GENERAL PROVISIONS

Control of diseases with drugs should be carried out only on the basis of an accurate diagnosis by a veterinarian or a qualified fish disease specialist.

An accurate diagnosis is essential for proper selection of medicine. The person making the diagnosis will often need to use the service of a diagnostic laboratory for fish diseases. Laboratory examination of fish is often essential for proper drug selection and for ensuring an appropriate route for application. The management should ensure that a memeber of staff is responsible for general health maintenance liaison with specialists. A person carrying out the application of drugs must be adequately trained to understand the procedure of application and the risks.

In determining treatments veterinarians/authorized persons should be guided by the principles of maximum effectiveness combined with minimum risk. Veterinary drugs must be used in compliance with regulations of the official agency having jurisdiction. Veterinary drugs encompass compounds for the prevention and treatment of viral, bacterial, fungal and protozoan diseases as well as for the modification of physiological status and responses of fish. Regulations should require that drugs for fish treatment be prescribed by a veterinarian or authorized person.

6.6.4 *Administration of Medicines*

Special attention should be paid to using the correct dosage, and route of administration. Note should be taken of all warning statements and contradictions for use (in particular any incompatibility with other medicinal products). It is important not to use products once the expiry date has passed.

Uncontrolled and unlimited use of medicinal products may lead to the accumulation of undesirable residues in the fish treated and in the environment, and that the continuous use of antibacterial, antiprotozoan or anthelmintic products may favour the development of resistance. It is the responsibility of the veterinarian or other authorized persons to draw up programmes of preventive medicine for the fish farmer and to stress the importance of sound management and good husbandry in order to reduce the likelihood of fish diseases. Every effort should be made to use only those drugs known to be effective in treating the specific disease.

In disease circumstances where no authorized product exists or certain indications or target species are not provided for in the product literature, the veterinarian/authorized person can on his/her own responsibility or with advice from the manufacturer have recourse to other licensed products for off-label use. Administration of products in this manner, however, may have unpredictable side effects and give rise to unacceptable residue levels. Veterinarians should therefore only embark on such uses after the most careful consideration of the needs of the disease situation. Under these circumstances, a significantly extended withdrawal time should be assigned for drug withdrawal prior to marketing the fish. The veterinarian is responsible for providing written instructions on the use and withdrawal times for all medicines used off-label. Off-label use by persons other than veterinarian must not be permitted except when such use is conducted or permitted under the supervision or prescription of the veterinarian.

The veterinarian should stress the need for diseased fish to be segregated from healthy stock or fish and treated individually where possible.

Beyond his/her responsibility for advice on measures that will reduce the incidence of disease and for controlling it when it arises, the veterinarian is also responsible for taking the welfare of fish stock fully into account

6.6.5 *WITHDRAWAL PERIOD - CONTROL RELATED TO THE PROTECTION OF PUBLIC HEALTH*

Good practice in the use of veterinary drugs (GPVD),is the official recommended or authorized usage including withdrawal periods, approved by national authorities, of veterinalry drugs under practical conditions. The maximum residue limit for veterinary drugs (MRLVD) is based on the type and amount of residue considered to be without toxicological hazard for human health while taking into account other relevant public health risks.

At harvesting, veterinary drug residues in fish must not be above the maximum permissible levels set up by the official agency having jurisdiction.

Drugs applied to fish remain in their tissues for a longer time compared to other animals. The length of time for elimination of drug and of drug metabolites depends upon a number of factors, such as drug properties, route of application, fish species and its physiological condition, salinity of water and especially the water temperature. These variable factors make it difficult to set withdrawal periods. Drugs used for treatment as well as prophylaxis must not be given to fish during a certain period of time before slaughtering. Such time must be at least as long as the withdrawal period by the authority for the species and the drug in question.

The best way of controlling drug residues in fish is preslaughter control. If the average drug concentration in tested fish is above the MRL, slaughter of the batch has to be postponed.

The official agency having jurisdiction should have access to laboratory services to ensure that drug residues in slaughtered fish is within the acceptable range.

Appropriate methods should be used for sampling, analytical procedures and examination to determine compliance with Codex recommendations.

A post slaughter control should reject all fish that do not comply with the requirements set for veterinary drug residues by the Codex Alimentarius.

6.6.6 *INFORMATION ON VETERINARY DRUGS*

Product information considered essential by the national authority to ensure the safe and effective use of veterinary medicinal products must be made available in the form of labelling and nationally approved data sheets or leaflets. Information on dosage schedules should be complemented by instructions on dose-related recommended withdrawal periods, contra-indications and any other constraints on the use of the product including any precautions regarded as necessary.

6.6.7 *AMOUNTS TO BE SUPPLIED*

Medicines should not be supplied in excess of immediate requirements as this may lead to incorrect use and/or to the deterioration of the products.

6.6.8 *PREPARATION OF MEDICINES AND HANDLING RISKS*

Incorporation of medicines into feed on the fish farm and handling and administration of medicated feeds, may give rise to potentially hazardous effects in the human operator. The preparation of medicines and medicated feeds should be undertaken by suitably trained personnel, using appropriate techniques and equipment. Any harmful effects in persons preparing and administering veterinary medicines should be reported to the appropriate national authority.

To avoid the presence of unacceptable residues in fish or by-products of fish origin it is essential that the fish farmer adheres to the withdrawal period established for each product and dose regime, or, to a suitably lengthy withdrawal period where none is specified. Full instructions should be given as to how this period is to be calculated including the use of on site residue detection methods where applicable and on the disposition of any fish harvested during treatment or before the end of the withdrawal period.

6.6.9 *ENVIRONMENT AND AQUACULTURE*

Veterinarians and other authorized persons should keep in mind that any use of medicines (therapeutic or prophylactic) will have an influence on the aquatic environment.

Fish treated will normally include both "healthy" and "sick" individuals. The aquatic environment is then exposed to relatively large amounts of veterinary drugs through faeces and non-ingested medicated feed. The same exposure will occur in connection with prophylactic medication.

To avoid their accumulation in the environment, it is desirable to limit the use of veterinary drugs to the extent possible.

It is also important to use medicinal agents with low toxicity to aquatic organisms, and medicines which degrade relatively quickly in the aquatic environment.

6.6.10 RECORD KEEPING REQUIREMENTS

The veterinarian and/or the fish farmer or other authorized persons should keep a record of the products used, including the quantity, the date of administration, time of harvest, and the identity of fish on which the medicines were used. Records should be kept for at least two years, and presented when required by the competent authorities.

6.6.11 WITHDRAWAL OF VETERINARY DRUGS

Where the veterinarian or other authorized person suspects that unexpected adverse reactions involving illness, abnormal clinical signs, or death in fish, or any harmful effects in persons administering veterinary medicines or harmful effects to the environment, have been associated with a veterinary product they should be reported to the appropriate national authority. Regular feed-back or inforamtion to veterinarians and manufacturers on suspected adverse reactions should be encouraged.

6.6.12 STORAGE OF VETERINARY DRUGS

Veterinary products should be correctly stored in accordance with label instruction. It should be kept in mind that storage temperatures are critical for some medicines, while exposure to light or to moisture can damage others. Prescription medicines should be separated from non-prescription medicines.

All veterinary products should be stored in secure premises and kept under lock and key where practicable and out of reach of children and animals.

6.6.13 DISPOSAL OF VETERINARY DRUGS

Veterinary drugs remaining after treatment has been completed must be disposed of safely . Partially used containers should not be retained for future use. Unused drugs beyond their expiry date may however be returned to the vendor if there is an agreement to that effect. Where administration of medicines is not under direct veterinary supervision, users should be advised about correct disposal measures, for example, to reduce potential contamination of the environment.

The official agency having jurisdiction should be encouraged to give guidelines on how to handle this particular problem.

6.7 Pesticides

6.7.1 PESTICIDES MUST BE USED IN COMPLIANCE WITH REGULATIONS OF OFFICIAL AGENCIES HAVING JURISDITION

Certain groups of pesticides, such as herbicides, algicides, insecticides, limacides and piscicides can be useful in aquaculture. Establishments should apply only those compounds which are registered for use in aquaculture and/or the aquatic environment by the official agency having jurisdiction.

Application of pesticides to rearing areas and their surroundings must be done with great care and with adherence to the instructions given by the manufacturer or the specialist. Persons carrying out the application of pesticides must be adequately trained to understand the application procedure and the risks.

6.7.2 HERBICIDES FOR LAND VEGETATION CONTROL ON ESTABLISHMENTS MUST BE SAFE FOR FISH AND FOR THE REARING ENVIRONMENT

6.7.3 WITHDRAWAL TIMES AND TOLERANCES FOR PESTICIDES MUST BE RESPECTED IN ORDER TO PREVENT RESIDUES IN FISH FOR HUMAN CONSUMPTION.

6.7.4 RECORDS MUST BE KEPT OF PURCHASES AND THE USE OF PESTICIDES IN EACH REARING UNIT AND OF THE LAND AREA OF THE ESTABLISHMENTS.

6.8 Other chemicals

6.8.1 CHEMICALS OR HERBICIDES USEFUL IN THE TREATMENT OF FISH OR IN THE REARING ENVIRONMENT WHICH DO NOT BELONG TO CATEGORIES MENTIONED UNDER 6.3, 6.6 AND 6.7 SHOULD BE USED ONLY IF SAFE FOR THE HYGIENIC QUALITY OF FISH AND FOR THE REARING AND SURROUNDING ENVIRONMENT.

6.9 Integrated aquaculture

6.9.1 INPUTS IN INTEGRATED AQUACULTURE SHOULD MEET REQUIREMENTS GIVEN IN 6. THEY SHOULD BE STANDARDIZED AND MONITORED.

Integration of aquaculture with animal and/or plant production or food industry can provide mutually beneficial utilization of nutrients and energy in by-products and wastes. The grow out phase of fish production in any of such linkages should comply with provisions of this Code.

7 FISH HEALTH AND DISEASES

7.1 Health status and its protection

7.1.1 THE APPEARANCE OF DISEASED FISH IS OFTEN AESTHETICALLY UNACCEPTABLE AND THEY SHOULD NOT BE MARKETED.

Fish of a suboptimal health status, which do not have obvious visible external or internal signs of disease, can be more sensitive to infectious fish diseases. Such a status can develop as a consequence of inadequate nutrition or as a result of stress by handling or poor environmental conditions in rearing units. Technology and management should minimize such risks which can impair economic viability of production and product quality.

7.1.2 ADEQUATE NUTRITION IS NECESSARY BOTH FOR GROWTH AND HEALTH OF FISH

Fulfilment of nutritional requirements is also beneficial for the quality of fish.

7.1.3 MANAGEMENT OF WATER QUALITY SHOULD SECURE GOOD CONDITIONS FOR FISH HEALTH

Water quality which maintains the good health of fish is equally beneficial for its hygienic quality.

7.1.4 HANDLING OF FISH SHOULD BE KEPT TO A MINIMUM AND CARRIED OUT UNDER CONDITIONS OF MINIMAL STRESS AND INCIDENCE OF MECHANICAL INJURIES.

7.1.5 VERTICAL AND HORIZONTAL TRANSMISSION OF INFECTION AND INFESTATION SHOULD BE PREVENTED.

7.1.6 FREQUENT MONITORING OF FISH HEALTH SHOULD BE PART OF THE PROPHYLACTIC MEASURES IN THE MANAGEMENT PROGRAMME.

7.1.7 EARLY AND ACCURATE DIAGNOSIS AND TIMELY INTERVENTION FOR FAST AND EFFICIENT CONTROL OF DISEASE OUTBREAKS ARE ESSENTIAL FOR THE PREVENTION OF LOSSES.

7.1.8 INTRODUCTION OF EXOTIC DISEASES TO FISH FARMS SHOULD BE MINIMIZED BY EFFECTIVE PROGRAMMES OF THE NATIONAL AGENCY HAVING JURISDICTION .

7.2 Hygienic significance of fish diseases

7.2.1 NONE OF THE CAUSAL AGENTS OF VIRAL, MYCOTIC AND PARASITIC DISEASES OF FISH HAVE BEEN SHOWN TO BE PATHOGENIC TO MAN.

Although not harmful to man the presence of disease makes the fish aesthetically unacceptable.

7.2.2 SOME BACTERIA CAUSING DISEASES IN FISH MIGHT BE REGARDED AS PATHOGENIC TO MAN BUT A LACK OF SUFFICIENT EPIDEMIOLOGICAL EVIDENCE OF THEIR IMPLICATION IN CASES OR OUTBREAKS OF HUMAN DISEASES STILL EXISTS.

7.2.3 A PART OF THE NORMAL MICROFLORA ON EXTERNAL SURFACES AND IN GUTS OF HEALTHY FISH BELONGS TO BACTERIAL SPECIES WHICH MAY BE POTENTIALLY PATHOGENIC TO MAN. THEY ARE NORMALLY CONTROLLED BY HYGIENIC GUTTING AND HANDLING OF FISH.

8 HYGIENIC REQUIREMENTS FOR HARVESTING, STORAGE AND TRANSPORT OF LIVE FISH.

8.1 Preparation for harvesting

8.1.1 IF VETERINARY DRUGS HAVE BEEN USED, OR IF THERE ARE OTHER INDICATIONS OF CONTACT WITH CHEMICALS, FISH SHOULD BE SAMPLED BEFORE HARVESTING AND EXAMINED FOR CONTAMINANTS AND OTHER PARAMETERS OF IMPORTANCE FOR HYGIENIC QUALITY.

The procedure for determining the necessity and method of sampling should be stipulated by the official agency having jurisdiction. Decisions about sampling and laboratory tests should be based upon the history of treatment with veterinary drugs, application of pesticides and/or water quality on establishments and in units to be fished-out.

The interval between sampling and harvesting should be sufficient for the timely availability of data from laboratory analysis. The results of analysis should be the basis for the decision whether to proceed with or postpone the preparations for harvesting.

8.1.2 FISH OF TEMPORARILY OBJECTIONABLE HYGIENIC QUALITY SHOULD EITHER REMAIN IN THE SAME UNIT FOR A SPECIFIED TIME INTERVAL OR BE TRANSFERRED FOR PURIFICATION TO ANOTHER UNIT OR LOCATION.

Such situations will usually not develop; properly informed managers will respect withdrawal times for veterinary drugs and secure safe use of pesticides and other chemicals.

8.1.3 FISH HYGIENICALLY FIT FOR HARVESTING SHOULD BE STARVED OR TREATED ADEQUATELY FOR EDMPTYING THEIR GUTS.

Fish with empty guts better withstand the handling involved in harvesting. Hygiene in transport is also better with such fish; water quality in live transport will be superior; killed fish will also remain clean in boxes or other utensils for transport.

The time for gut emptying should be adjusted to the species, temperature and characteristics of the rearing unit.

In some species, sham-netting a day or several days before netting scares fish and leads to gut emptying. In others, up to 7 to 10 days of fasting is advisable.

8.1.4 UNITS TO BE HARVESTED SHOULD BE PREPARED, IF APPLICABLE, BY PARTIAL OR COMPLETE DRAINING OR OTHER MEASURES FOR SECURING OPTIMUM CONDITIONS FOR FISH AND FOR A FAST OPERATION.

8.2 Equipment, utensils and personnel

8.2.1 BEFORE ANY FISH IS TAKEN OUT OF A UNIT, ALL EQUIPMENT AND UTENSILS WHICH WILL COME IN CONTACT WITH FISH SHOULD BE CHECKED FOR CLEANLINESS AND HOSED DOWN WITH WATER OR SEA WATER TO REMOVE ALL VISIBLE REMNANTS OF DIRT, SLIME AND BLOOD

The purpose of checking is to ensure that all traces of contaminating matter have been removed earlier or, contrarily, to clean any remnants, such as slime, scales, blood, dirt, etc., which may cause discolouration, contamination or offensive odours in fish. In most situations such additional cleaning and wetting can be carried out while fish are being netted.

It is also important to have the surfaces wet in order to minimize damage to fish skin. Hosing down should be thorough, especially during warm weather in order to cool surfaces as much as possible.

8.2.2 ALL TUBS, AND CONVEYING EQUIPMENT USED FOR HARVESTING SHOULD BE KEPT WET DURING THE WHOLE OPERATION.

Wetting the fish should secure smooth contact and minimize abrasions.

8.2.3 FISHING GEAR SHOULD BE FREED OF ANY DEAD FISH AND DIRT AFTER EACH HAUL

Dead fish and organic matter left in nets or other gear will decompose and contaminate subsequent catches.

8.2.4 ALL EQUIPMENT AND UTENSILS SHOULD BE THOROUGHLY CLEANED AND RINSED DURING ANY BREAK IN HARVESTING OPERATIONS

Any filth, scales, slime or blood will be difficult to remove if allowed to dry and accumulate on surfaces that come into contact with fish. These surfaces will thus contaminate the next loads of fish.

8.2.5 WATER USED TO CLEAN EQUIPMENT AND UTENSILS SHOULD NOT BE ALLOWED TO DRAIN INTO THE UNIT USED FOR HARVESTING THE FISH OR INTO NEIGHBOURING UNITS.

The fishing out area should be constructed and managed in such a way that the potentially contaminating water from cleaning and rinsing

does not contaminate fish in the units. Such water should be either drained into an adequate canal with a pump for decanting and subsequent removal for safe decomposition or unloaded at a safe distance away from the production area.

8.2.6 AFTER THE END OF HARVESTING, ALL NETS, EQUIPMENT AND UTENSILS SHOULD BE HOSED DOWN AT THE SAME SITE AND THEN BROUGHT TO THE SPECIFIC AREA TO BE WASHED WITH A SUITABLE CLEANING DISINFECTANT AND THEN RINSED.

Mechanical cleaning at the end of the operation should prevent drying of filth and secure efficient disinfection of equipment and utensils at a proper safe location on the establishment.

8.2.7 TANKS FOR TRANSPORTATION OF LIVE FISH SHOULD BE WASHED AFTER UNLOADING AND SUBSEQUENTLY THOROUGHLY CLEANED WITH A SUITABLE CLEANING AGENT AND RINSED AT THE DESIGNATED LOCATION ON THE ESTABLISHMENT.

8.2.8 ICE NEEDED FOR CHILLING THE HARVEST SHOULD BE MADE FROM POTABLE WATER CONFORMING TO SLS 614 OR CLEAN SEA WATER AND SHOULD NOT BE CONTAMINATED WHEN MANUFACTURED, TRANSPORTED, HANDLED OR STORED.

Ice made from water which is not potable may contaminate the fish with water-borne microorganisms or other objectionable or even harmful substances. Such contamination will result in the loss of quality, reduced keeping time or might create a definite health hazard. The potable fresh water should conform to SLS 614. Establishments may have their own ice-making machines. Alternatively ice can be brought to the harvesting location by the vehicle intended to transport the harvest to the market.

8.2.9 FRESH WATER FOR KILLING AND FOR TRANSPORTATION OF LIVE FISH SHOULD BE POTABLE OR , WHEN UNAVAILABLE, IT SHOULD SATISFY REQUIREMENTS FOR ACCEPTANCE BY THE OFFICIAL AGENCY HAVING JURISDICTION.

Water of unacceptable quality may contaminate fish with water-borne microorganisms or other objectionable or even harmful substances. Such contamination will result in loss of quality, reduced keeping time or might create a definite health hazard.

Where potable water cannot be made available in sufficient quantity at the harvesting site, treated water, acceptable to the official agency having jurisdiction, can be used.

8.2.10 SEA WATER FOR KILLING AND FOR TRANSPORTATION OF LIVE FISH SHOULD BE CLEAN SEA WATER OF A QUALITY THAT SATISFIES MICROBIOLOGICAL REQUIREMENTS FOR POTABLE WATER.

8.2.11 EFFECTIVE MEASURES SHOULD BE TAKEN TO PROTECT THE HARVEST HANDLING AREA AGAINST INSECTS, RODENTS, BIRDS AND OTHER VERMIN.

Rodents, birds and insects are potential carriers of human pathogens which could be transmitted to man by contaminated fish.

8.2.12 DOGS, CATS AND OTHER ANIMALS SHOULD BE EXCLUDED FROM THE HARVEST HANDLING AREA.

For aesthetic reason and public health hazards, the area used for handling the fish harvest should be kept free of animals.

8.2.13 VEHICLES AND UTENSILS USED FOR LOADING FISH SHOULD BE READY FOR USE

Tanks for transportation of live fish should be adequately filled with water and aeration or oxygenation devices adjusted for receiving fish.

Trucks with refrigerated space should be kept closed until the beginning of loading. Boxes, ice and other utensils for killed fish should be prepared.

8.3 Harvesting and loading

8.3.1 Harvesting

8.3.1.1 THE QUANTITY OF FISH TO BE TAKEN OUT BY HARVESTING SHOULD BE PLANNED IN ADVANCE.

8.3.1.2 WHEN COMPLETE HARVESTING OF A UNIT IS UNDERTAKEN, ADEQUATE TRANSPORTATION CAPACITY SHOULD BE AVAILABLE OR CONTINUOUSLY ARRIVING FOR THE WHOLE CATCH.

8.3.1.3 HARVESTING TECHNIQUES SHOULD BE ADJUSTED TO THE SPECIES, (ESPECIALLY CRUSTACEANS) SIZES, METHODS OF CULTIVATION, CHARACTERISTICS OF THE REARING UNIT AND CLIMATIC CONDITIONS.

There may also be national regulations that must be complied with.

8.3.1.4 THE SEQUENCE OF PROCEDURES DURING HARVESTING SHOULD BE ADJUSTED TO THE TYPE OF FISH TRANSPORTATION.

Depending upon product and other specifications, fish will be transported from the harvested unit alive or freshly dead.

8.3.1.5 IN HOT CLIMATES OR WEATHER, HARVESTING SHOULD BE PREFERABLY CARRIED OUT DURING THE MORNING HOURS WHEN WATER AND AIR TEMPERATURES ARE LOWEST AND EXPOSURE TO THE DRYING EFFECT OF THE SUN IS MINIMAL.

8.3.1.6 THE WHOLE PROCESS OF HARVESTING AND LOADING SHOULD BE EFFICIENT AND CAREFUL TO PRESERVE THE HYGIENIC QUALITY OF FISH.

8.3.1.7 HARVESTING SHOULD BE CARRIED OUT WITH MINIMUM OF STRESS, FATIGUE AND PHYSICAL DAMAGE TO FISH.

Techniques and procedures of harvesting should prevent excessive stress, intensive or prolonged muscular exercise as well as internal and external physical injuries. The size, layout and construction of units, the equipment and organization of operations should be harmonized.

In tropical climates or weather, such ponds should be partially harvested or harvested by multiple seining while full with water and, if necessary, harvested completely at reduced water levels and complete draining.

8.3.1.8 TECHNIQUES AND PROCEDURES OF HARVESTING SHOULD EFFICIENTLY CONCENTRATE THE DESIRED QUANTITY OF FISH AT THE DESIRED TIME.

8.3.1.9 WHEN FEED CANNOT BE EFFECTIVELY WITHDRAWN, THE HARVESTING TECHNIQUE SHOULD INCLUDE A STEP FOR PURGING THE DIGESTIVE TRACT OF THE FISH.

8.3.1.10 THE PROCESS OF CONCENTRATING AND LANDING SHOULD MINIMIZE STIRRING MATTER UP FROM THE BOTTOM OF THE UNIT.

8.3.1.11 UTENSILS FOR NETTING OR OTHERWISE CONCENTRATING THE FISH SHOULD BE OF SUCH PROPERTIES AND QUALITY THAT PHYSICAL DAMAGE IS AVOIDED OR MINIMAL.

8.3.1.12 FISH CONCENTRATED FOR LANDING AND KEPT CONCENTRATED FOR ANY EXTENDED PERIOD SHOULD BE PROVIDED WITH ENOUGH OXYGEN AND WATER CIRCULATION.

Mechanical aeration of water or adequate circulation or enough space and water exchange with the surrounding should provide hygienic conditions to the densely concentrated fish.

8.3.1.13 FISH SHOULD NOT BE TRAMPLED OR STOOD UPON WHEN CONCENTRATED IN NET OR OTHER DEVICES AND SHOULD NOT BE PILED UP DEEPLY ONTO SORTING DEVICES OR INTO CONTAINERS WITHOUT WATER.

8.3.1.14 LANDING OF FISH SHOULD BE PREFERABLY CARRIED OUT BY MECHANICAL DEVICES ADJUSTED TO THE SPECIES, SIZE AND OTHER CONDITIONS, IN ORDER TO MINIMIZE ADVERSE EFFECTS OF MANIPULATION UPON QUALITY.

8.3.2 *Sorting and grading*

8.3.2.1 SORTING AND GRADING SHOULD BE INTEGRATED INTO THE WHOLE OPERATION IN SUCH A MANNER AS TO DEVICE AND SHOULD NOT BE PILED UP DEEPLY ONTO SORTING DEVICES OR INTO CONTAINERS WITHOUT WATER.

8.3.2.2 FISH WHICH HAVE DIED BEFORE HARVEST OR SHOW EXTERNAL SIGNS OF DISEASE OR PHYSICAL DAMAGE THUS RENDERING THEM UNFIT FOR HUMAN CONSUMPTION SHOULD BE SEGREGATED AS SOON AS POSSIBLE PRIOR TO OR DURING SORTING AND GRADING, AND KEPT SEPARATE.

Fast removal of unacceptable fish is essential for the overall hygiene of operation and for the hygienic quality of fish. Culled unfit fish, other animals and substances should be utilized or disposed of by means acceptable to the official agency having jurisdiction.

8.3.2.3 ANY FOREIGN OR UNDESIRABLE ANIMALS, PLANTS, MUD OR OTHER MATERIAL SHOULD BE REMOVED DURING SORTING AND/OR GRADING.

8.3.2.4 THE SORTING SHOULD BE CARRIED OUT, WHERE APPLICABLE, BY MECHANICAL DEVICES IN ORDER TO SPEED UP THE PROCESS AND IMPROVE ITS QUALITY.

In and establishment with adequate facilities, sorting and grading of live fish can be conveniently carried out at a centralized location.

8.3.2.5 CATCHES FROM POLYCULTURE TECHNOLOGIES SHOULD BE SORTED RAPIDLY IN ORDER TO AVOID DAMAGE DUE TO ABRASION, PARTICULARLY WHERE COMPOSITION OF SPECIES INCLUDES SPINY OR ROUGH SKINNED SPECIES.

8.3.3 *Handling and packaging of fresh fish*

8.3.3.1 FISH DESTINED FOR TRANSPORTATION IN FRESH FORM SHOULD BE QUICKLY SORTED, IF APPLICABLE, CHILLED AND KILLED.

Rapid cooling after harvesting should ensure maintenance of good hygienic quality and prolong shelf life. For rapid cooling fish should be introduced into a tank with adequately chilled water. For many species, chilling will also be a convenient method of killing.

8.3.3.2 KILLING SHOULD BE PERFORMED HUMANELY AND QUICKLY

Fish should be killed by methods acceptable to the competent authority which might include spiking or by transfer to sufficiently cold seawater or clean water or by percussive stunning.

8.3.3.3 BLEEDING OF LARGE FISH, IF APPLICABLE, SHOULD BE CARRIED OUT IN CONTAINERS.

The quality of bled fish is more consistent. However, they must also be chilled rapidly.

8.3.3.4 PACKAGING CONTAINERS SHOULD BE CLEAN AND COME FROM A HYGIENIC STORAGE AREA. PACKAGING SHOULD BE CARRIED OUT UNDER CONDITIONS WHICH PREVENT CONTAMINATION OF THE PRODUCT.

Packaging containers should not transfer to the fish any objectionable or harmful substances, odours or flavours, and should protect fish against damage, deterioration or contamination.

8.3.3.5 FRESH COOLED FISH SHOULD BE STOWED IN BOXES, BULK SHELF STOWAGE IS NOT RECOMMENDED, UNLESS USED FOR SHORT TERM TRANSPORTATION.

Fish should be stowed in boxes according to species and sizes in an orderly manner and properly iced, with fine crushed ice; boxes should not be overfilled.

8.3.3.6 ADEQUATE QUANTITIES OF FINELY DIVIDED ICE SHOULD BE USED IN PACKING FISH FOR TRANSPORT. THE ICE SHOULD BE WELL DISPERSED AMONGST THE FISH AND SHOULD ALSO SURROUND IT IN SUFFICIENT AMOUNTS TO KEEP IT OUT OF CONTACT WITH THE CONTAINER SURFACES DURING THE JOURNEY.

The amount of ice required when packing will depend on the length of journey and the ambient temperatures involved. The ice should always be more than enough to last the journey; the quantity will depend on the ambient temperature and available insulation. If the ice is well mixed through the load and surrounding it, then deterioration of fish quality due to rise of temperature and the resulting growth of microorganisms will be minimized.

8.3.4 *Live fish transportation*

8.3.4.1 HARVESTED LIVE FISH CAN BE TRANSPORTED WITHIN THE ESTABLISHMENT FOR STORAGE, CONDITIONING OR PURIFICATION OR DIRECTLY TO THE MARKET.

Any chemicals, drugs or anesthetics used should be acceptable to the national agency having jurisdiction.

8.3.4.2 TRANSPORTATION OF LIVE FISH SHOULD BE CARRIED OUT IN CONTAINERS OF ADEQUATE DESIGN AND CONSTRUCTION FOR THE FORESEEN LOAD AND TRANSPORT CONDITIONS.

8.3.4.3 SUPPORTING EQUIPMENT SHOULD MAINTAIN DESIRABLE OXYGEN CONCENTRATION IN WATER. FOR LONG DISTANCE TRANSPORTATION IT MAY BE NECESSARY TO CARRY EMERGENCY DEVICES FOR OXYGENATION.

8.3.4.4 FOR TRANSPORT TO DISTANT MARKETS, LIVE FISH FROM POND CULTURE SYSTEMS SHOULD BE FLUSHED OUT AND CONDITIONED BY STORING FOR A SUFFICIENT TIME TO EMPTY THEIR GUTS COMPLETELY AND TO RECOVER FROM NETTING AND HARVESTING STRESS. SUCH CONDITIONING CAN BE CARRIED OUT IN SPECIAL UNITS WITH A CONSTANT WATER FLOW OR WITHIN THE UNIT BEING HARVESTED.

8.3.4.5 THE WATER TEMPERATURE IN THE TRANSPORTATION CONTAINERS SHOULD BE REDUCED ADEQUATELY AS TO PREVENT STRESS BY SUDDEN TEMPERATURE DROP AND YET TO SECURE REDUCTION OF THE METABOLIC RATE IN FISH.

The difference between the temperature in the harvested unit and in the transportation container should not be greater than tolerated by the species. Stress or mortality in transportation caused by temperature shock, can cause water quality deterioration and impair the hygienic quality of fish.

8.3.4.6 THE RATIO BY VOLUME BETWEEN THE WATER AND THE FISH SHOULD BE PREDETERMINED BEFORE LOADING TO ENSURE ITS SUITABILITY FOR THE SPECIES, WATER TEMPERATURE, LENGTH OF TRANSPORTATION AND THE FORESEEN FREQUENCY OF WATER EXCHANGE ON ROUTE.

9 HYGIENE CONTROL PROGRAMME

9.1 IT IS DESIRABLE THAT EACH AQUACULTURE ESTABLISHMENT IN ITS OWN INTEREST DESIGNATES A SINGLE INDIVIDUAL WHOSE DUTIES ARE PREFERABLY DIVORCED FROM PRODUCTION TO BE HELD RESPONSIBLE FOR THE CLEANLINESS AND HYGIENE OF THE ESTABLISHMENT.

Such a person or his staff should be a permanent part of the organization or employed by the organization and should be well trained in the use of special cleaning tools, in applying cleaning and disinfection procedures, and in the significance of contamination and the hazards involved. A permanent cleaning and disinfection schedule should be drawn up to ensure that all parts of the establishment as well as equipment and utensils are cleaned appropriately and that critical areas, equipment and utensils are designated for cleaning and/or disinfection daily or as most appropriately required.

10 LABORATORY CONTROL

10.1 IN ADDITION TO ANY CONTROL BY THE OFFICIAL AGENCY HAVING JURISDICTION, IT IS DESIRABLE THAT EACH AQUACULTURE ESTABLISHMENT IN ITS OWN INTEREST SHOULD HAVE ACCESS TO LABORATORY SERVICES TO CONTROL THE SAFETY AND QUALITY OF THE INPUTS AND PRODUCTS.

The extent and type of such services will vary with the aquaculture products and method of production as well as the needs of the management. Such control should reject all fish that are unfit for human consumption and advise about prevention of poor product quality.

Analytical procedures used should follow recognized standard methods in order that the results may be readily interpreted.

11 END PRODUCT SPECIFICATIONS

11.1 APPROPRIATE METHODS SHOULD BE USED FOR SAMPLING AND EXAMINATION TO DETERMINE THE COMPLIANCE WITH THE FOLLOWING SPECIFICATIONS:

a) FISH SHOULD BE FREE FROM OBJECTIONABLE MATTER AND PARASITES TO THE MAXIMUM EXTENT POSSIBLE IN GOOD MANUFACTURING PRACTICE;

b) FISH SHOULD BE FREE FROM MICROORGANISMS IN AMOUNTS HARMFUL TO HUMANS AND SHOULD NOT CONTAIN ANY SUBSTANCES ORIGINATING FROM MICROORGANISMS IN AMOUNTS WHICH MAY REPRESENT A HAZARD TO HUMAN HEALTH.;

c) FISH SHOULD BE FREE FROM CHEMICAL CONTAMINANTS IN AMOUNTS WHICH MAY REPRESENT A HAZARD TO HUMAN HEALTH; AND

d) FISH SHOULD COMPLY WITH ANY REQUIREMENTS SET FORTH BY THE CODEX ALIMENTARIUS COMMISSION ON PESTICIDE RESIDUES, VETERINARY DRUG RESIDUES AND FEED ADDITIVES, INCLUDING DYES AS CONTAINED IN CODEX COMMODITY STANDARDS, OR SHOULD COMPLY WITH REQUIREMENTS ON PESTICIDE RESIDUES, VETERINARY DRUG RESIDUES AND FEED ADDITIVES, INCLUDING DYES, OF THE COUNTRY IN WHICH THE FISH WILL BE SOLD.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

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SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.

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