Methods for checking conformity of fishing gears to legal sizes/shapes

Sandhya K.M.
ICAR-Central Institute of Fisheries Technology, Kochi
sandhyafrm@gmail.com

Introduction

India, the second largest producer of fish in the world, employs over 14 million people in fishing and aquaculture. The marine capture fisheries is characterized by almost stagnant or at times declining fish catches, overfishing, overcapacity, increasing landing of bycatch/discards, increasing conflict over fish resources, mounting investment needs, and export market fluctuations. Since the last decade most of the major commercially exploited stocks are showing signs of over exploitation. However, demand for fish and fishery product is increasing considerably, both at the domestic and export front. It is therefore necessary to have some measures to control fishing in order to ensure the optimum utilization of the resources and reasonable economic returns to the fishermen. The principal purpose of fishery regulations and controls is to ensure a high, but sustainable yield to the fishery.

In situations where fishing effort is unregulated, there is the possibility that effort may become so high that there is a danger of a stock collapse, due to a depleted spawning stock and a resultant recruitment failure. If this danger exists, and it is not practical to regulate fishing effort directly, an increase in mesh size may be a useful alternative means of conserving the spawning stock. A suitable choice of mesh size should reduce the rate of capture of juveniles, and make it more likely that an individual will survive to the size of first maturity and have an opportunity of spawning at least once. A change of mesh size can usually be regarded as beneficial if it causes catches, in the long-term, to be greater than they otherwise would have been. A mesh regulation does not necessarily lead to an increase in the absolute level of catches, however, since these will continue to be influenced largely by natural variations in the level of recruitment.

Basic terms in netting

Fibre*:* It is the basic material of netting. Its length should be at least 100 times its diameter.

Netting yarn**:** Standardized universal term for all textile material which is suitable for the manufacture of netting for fishing gears and which can be knitted into netting by machine or by hand without having to undergo further process. Yarn is made into a netting by twisting or braiding. Monofilaments are used directly for making into netting without further process.

Netting twine/ folded yarn: is a netting yarn which is made of two or more single yarns or monofilaments by only one twisting operation.

Cabled netting twine: Combines two or more netting twines by one or two further twisting operations. Fibres are combined to form single yarns. Several single yarns are twisted together to form a netting twine. Several of these folded yarns or netting twines are twisted together by a secondary twisting operation to form a cabled netting twine.

Braided netting yarns**:** These are produced by interlacing a number of strands in such a way that they cross each other in diagonal direction. These braids are usually in the form of tubes. The braided netting yarns are available with or without core. Core is the term used for single

yarn, twisted yarn or monofilaments which do not belong to the braided tube but fills the space inside the tube.

***Netting*:** Netting is defined by ISO as a meshed structure of indefinite shape & size, composed of one yarn or one or more systems of yarns inter laced or joined or obtained by other means for example by stamping or cutting from sheet material or by extrusion

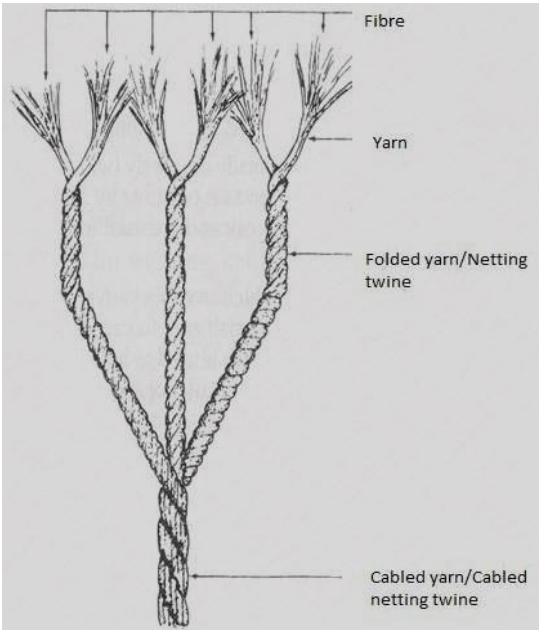

Fig.1. Basic structure of netting twine

Mesh: a design-formed opening, surrounded by netting material

Diamond mesh: a mesh composed of four sides of the same length

Square mesh: a diamond mesh in which adjacent sides are at right angles

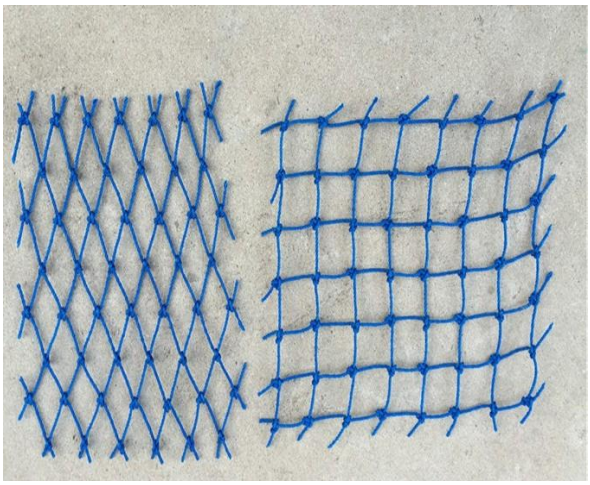

Fig.2. Diamond mesh and square mesh

N-direction: the direction at right angles to the general course of the netting yarn

T-direction: the direction parallel to the general course of the netting yarn

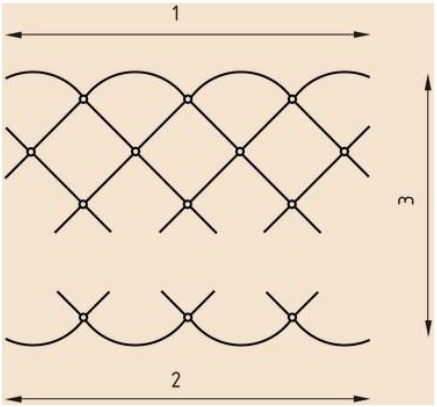

Fig.3. 1-T-direction (length wise); 2-General course of the netting yarn; 3-N-direction (depth wise)

Length of mesh side /half mesh/mesh bar: The distance between two sequential knots or joints, measured from centre to centre when the yarn between those points is fully extended.

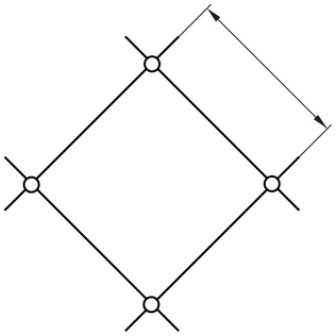

Fig.4. Length of mesh side/half mesh/mesh bar

Mesh size/length of mesh - The distance between the centres of two opposite knots in the same mesh when fully extended in the N direction. For square mesh, mesh bar is usually measured and mesh size is obtained by multiplying by 2.

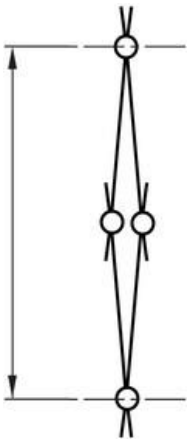

Fig.5. length of a mesh

Opening of mesh/mesh lumen - The longest distance between two opposite knots in the same mesh when fully extended in the N direction. For square mesh, opening of mesh is the distance between centres of two opposite mesh sides or mesh bars.

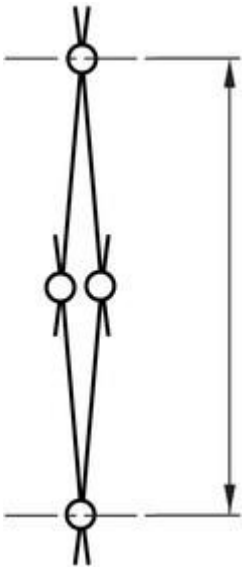

Fig.6. Diamond mesh opening

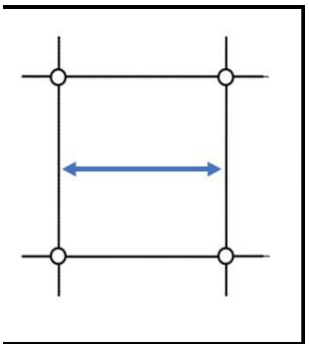

Fig.7. Square mesh opening

Method for determining mesh size-length of mesh

The Indian Standard,IS 15789: 2008: *Method of test for the determination of mesh size-length of mesh* can be followed for measurement of mesh size. The specimen to be tested in the dry state shall be exposed to the standard atmosphere at 65±2 percent relative humidity and 27^0± 2^0C temperature until they reach a moisture equilibrium for a period of 24h. Samples to be tested in the wet state shall be immersed in tap water, at a temperature of (20± 2^0C) for a period of not less than 12h. Surplus water shall be shaken off.

Straighten the netting manually in the N-direction. Using a ruler, the distance from the first knot or joint inclusive shall be measured with an accuracy of 1mm upto 10knot (exclusive). The mesh length is obtained by dividing the measured length by 5. At least 10 single measurements from different parts of netting shall be carried out. Record the size of the mesh in millimeters for each measurement and calculate the average size of the length of mesh rounded upto next millimeter. The mesh size is expressed as millimeter and the coefficient of variation and the confidence interval is also often given.

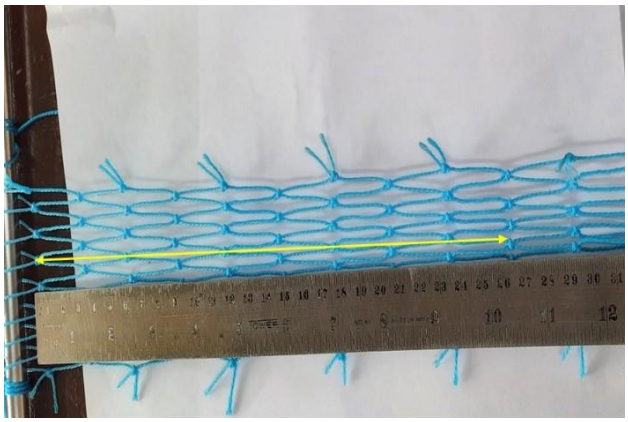

Fig.8. Mesh size measurement

Method for determining mesh size- opening of mesh (mesh lumen)

A mesh gauge is usually used for measuring opening of mesh. Indian standard IS 15789: 2008: *Method of test for the determination of mesh size-Opening of mesh* can be followed for determination of opening of mesh . A flat wedge gauge is inserted perpendicularly to the netting plane in the N direction for knotted netting by applying a constant force. The gauge shall be of 2mm thick, flat and shall have 2 tapering edges with a taper of one to eight. They shall have a hole at the narrow end. The edges of the gauge shall be rounded with a radius of 1mm. Either printed or engraved markers ending 2mm from the edges shall be used. The scale shall be graduated at intervals of 1mm, 5mm and 10mm. Different sizes of gauges are required to cover various ranges of mesh sizes.

The mesh opening will depend on the force exerted on the gauge and hence measuring force is also specified. Insert a gauge by its narrow end into the mesh opening perpendicular to stretched netting plane. Insert the gauge into the widest mesh opening using a suitable measuring force until it is stopped by the resistance of mesh. For netting of a mesh size of 50mm or less, a force equivalent to a mass of 2kg shall be applied. For mesh size above 50mm upto 120mm, a force equivalent to a mass of 5kg shall be applied and for netting of above mesh size of 120mm, a force equivalent to a mass of 8kg shall be used. Measure a minimum of 20 consecutive meshes. The size of each mesh shall be the width of the gauge at the point where gauge is stopped. The width shall be read at the top of the twine making sure that the same readings are obtained at both edges of the gauge. Record the size of opening of the mesh in millimeters for each measurement and calculate the average size of the opening of the mesh rounded upto next millimeter.

OMEGA mesh gauge

The OMEGA gauge is a new objective mesh gauge which can make precise and objective measurements of mesh opening that are free of human influence, on a wide range of netting material (Fonteyne et al., 2007). The OMEGA mesh gauge is an electric driven instrument that applies a pre-set longitudinal force to the mesh to be measured (Fonteyne, R. 2005). Once this force is achieved, the exact opening of the gauge is measured automatically. Mesh opening and measuring force are simultaneously shown on the digital display. When a series of measurements has been finalized, the mean mesh opening and number of measurements made will be displayed. OMEGA gauge was developed under an EU funded Combined R&D and Demonstration Project to make objective mesh measurements according to the protocol recommended by the ICES.

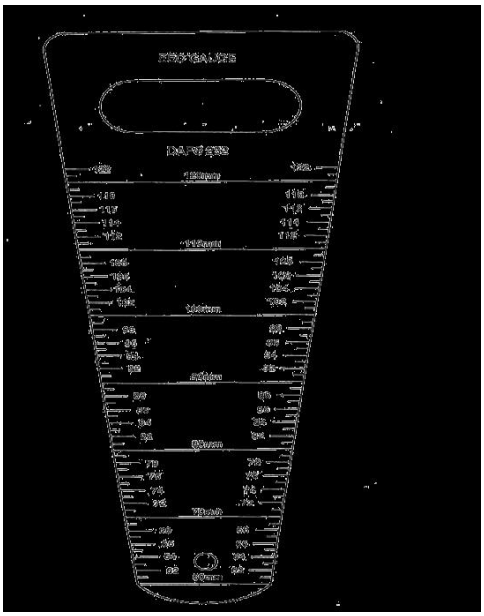

Fig.10.OMEGA mesh gauge

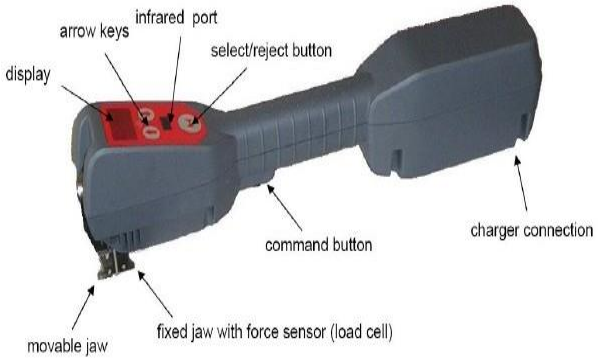

Fig.9. Flat mesh gauge

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