

LIFiBS meeting
Berlin, November 18, 2010



T90 technology for **Baltic cod fishing**

- minimising negative consequences for the marine environment -



Turned meshes history



In the early 1990s a new netting material (T90) with very good selective and protective properties was developed at the Sea Fisheries Institute in Gdynia, Poland. The improved parameters of this material results in the meshes remaining wide open throughout the fishing process.

The idea of T90 meshes technology was first presented in 1993 at the Annual Science Conference of the ICES in Dublin and then published. The investigations on characteristics of selective cod-ends with meshes turned 90° have been carried out by

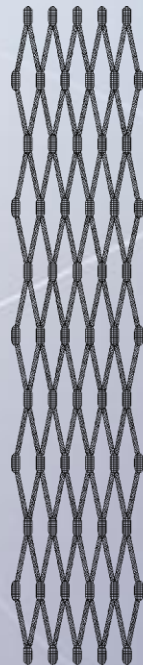
- Sea Fisheries Institute, Gdynia, Poland since 1996 and then in close co-operation with
- vTI Institute, Rostock, Germany (former Institute for Fishery Technology and Fish Quality, Hamburg)

Beginning from year 2000 the turned cod-ends investigations were conducted also on commercial fishing vessels, aiming to check a protection abilities as well as to test durability during normal commercial fishing

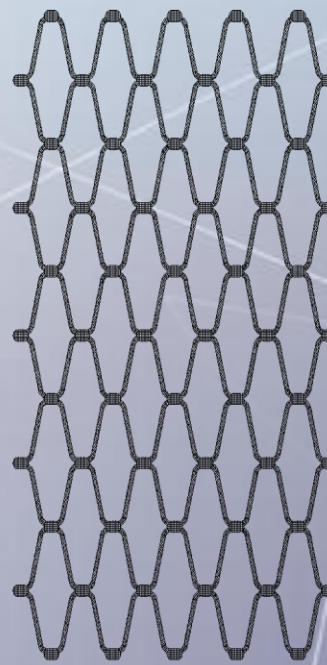
The turned meshes netting is made of typical diamond (standard) netting but that has to be turned 90° and does not require any changes in machinery or production technology in net factories.

The shapes of diamond and turned meshes are presented below.

diamond



T90





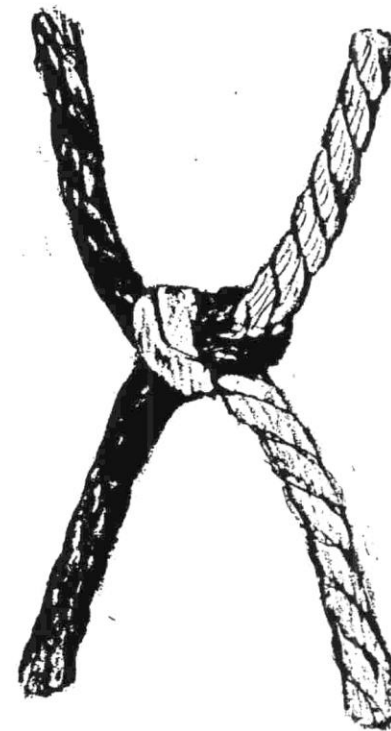
The shapes of T90 meshes and, in consequence, of codends and trawls are influenced by the properties of their netting material.

The number of meshes in the netting elements that are joined together should fulfill their mechanical properties. This means that the two elements (e.g. codend and extension or extension and belly end) do not affect each other, i.e. that one element does not exert excessive contraction or expansion on the other element.

Mesh bars shape around knots of two
different oriented meshes;



diamond



T90



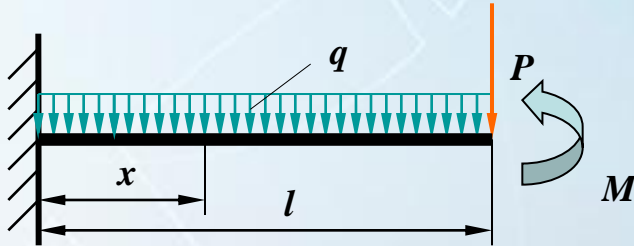
Parameters impacting the size of the meshes opening

The degree to which meshes open depends on:

- the mesh bar length,
- the mechanical properties of the material of which they are made i.e. the stiffness of their bars,
- forces acting onto a mesh,
- mesh construction.

The netting used to build fishing gear is manufactured with different types of twines. The twines can be braided or twisted made of polyamide or polyethylene.

Mesh bar deviation (x) and bend (y)

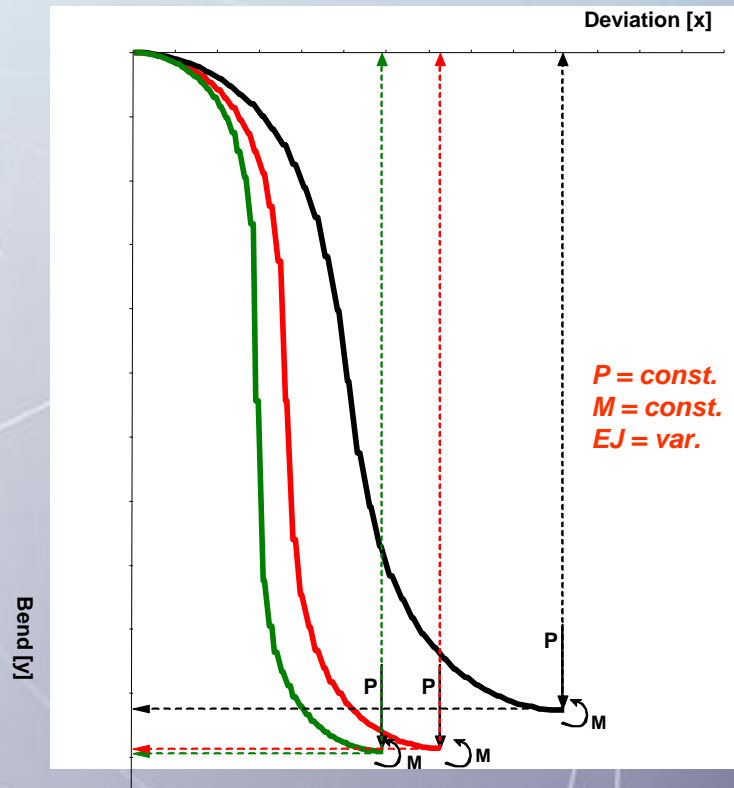


General dependence for calculation:

$$y = \frac{1}{2} \int_0^x \frac{f(l, q, P, x)}{\sqrt{(E \cdot J)^2 - [f(l, q, P, x)]^2}} dx$$

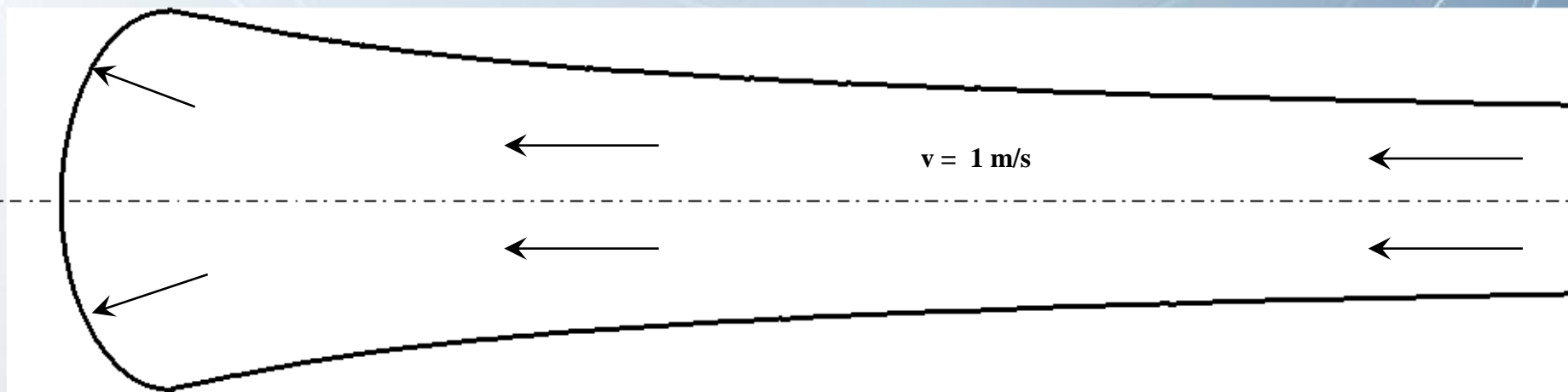
For $\rho = \text{const.}$, $\nu = \text{const.}$, $x = l$ bend of the mesh bar depends on: $y = y(l, d, P, E)$

if $EJ \uparrow$ then $y \downarrow$

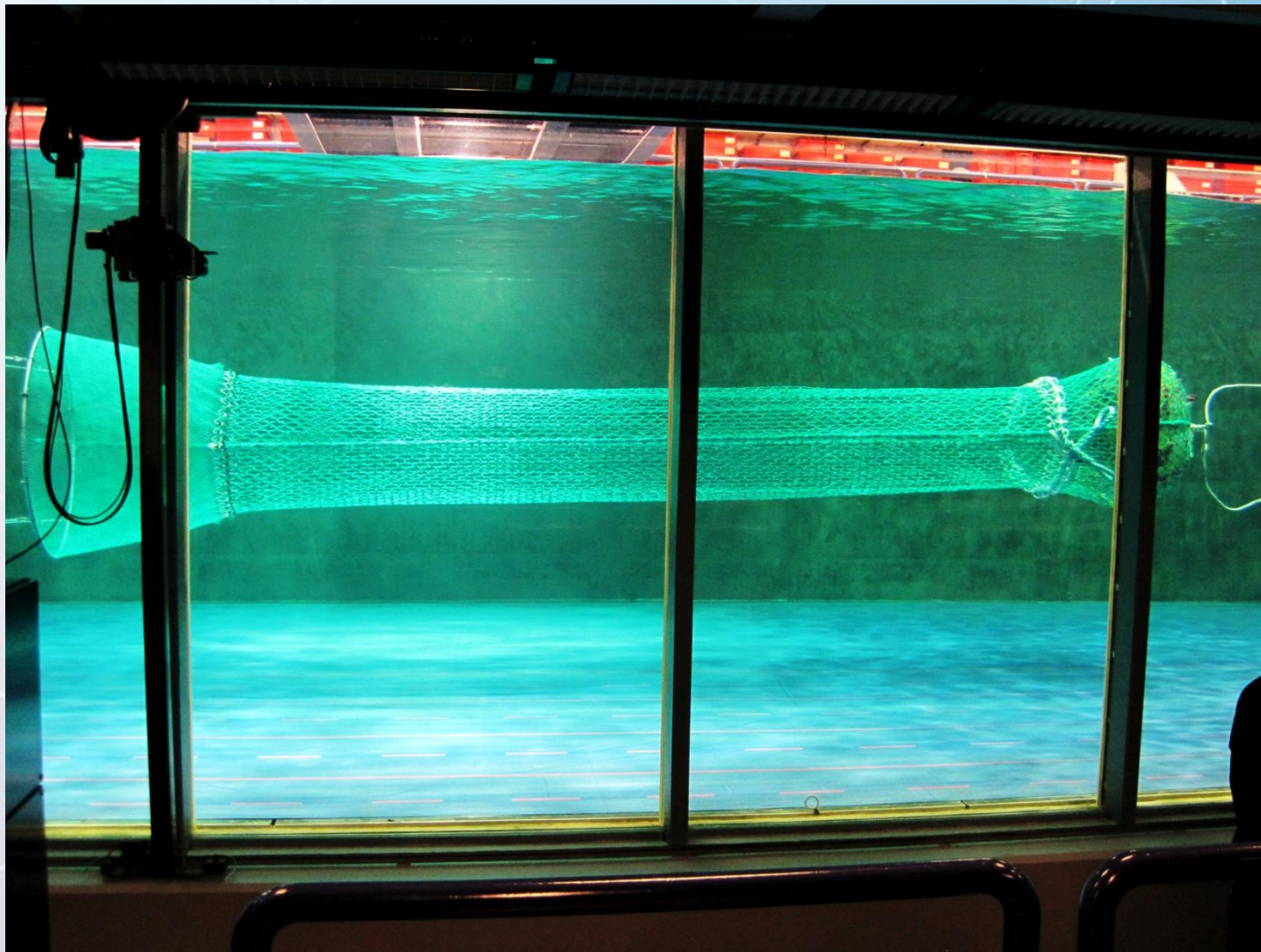




The shape of T90 codend theoretically calculated



The shape of commercial T90 codend - flume tank SINTEF -

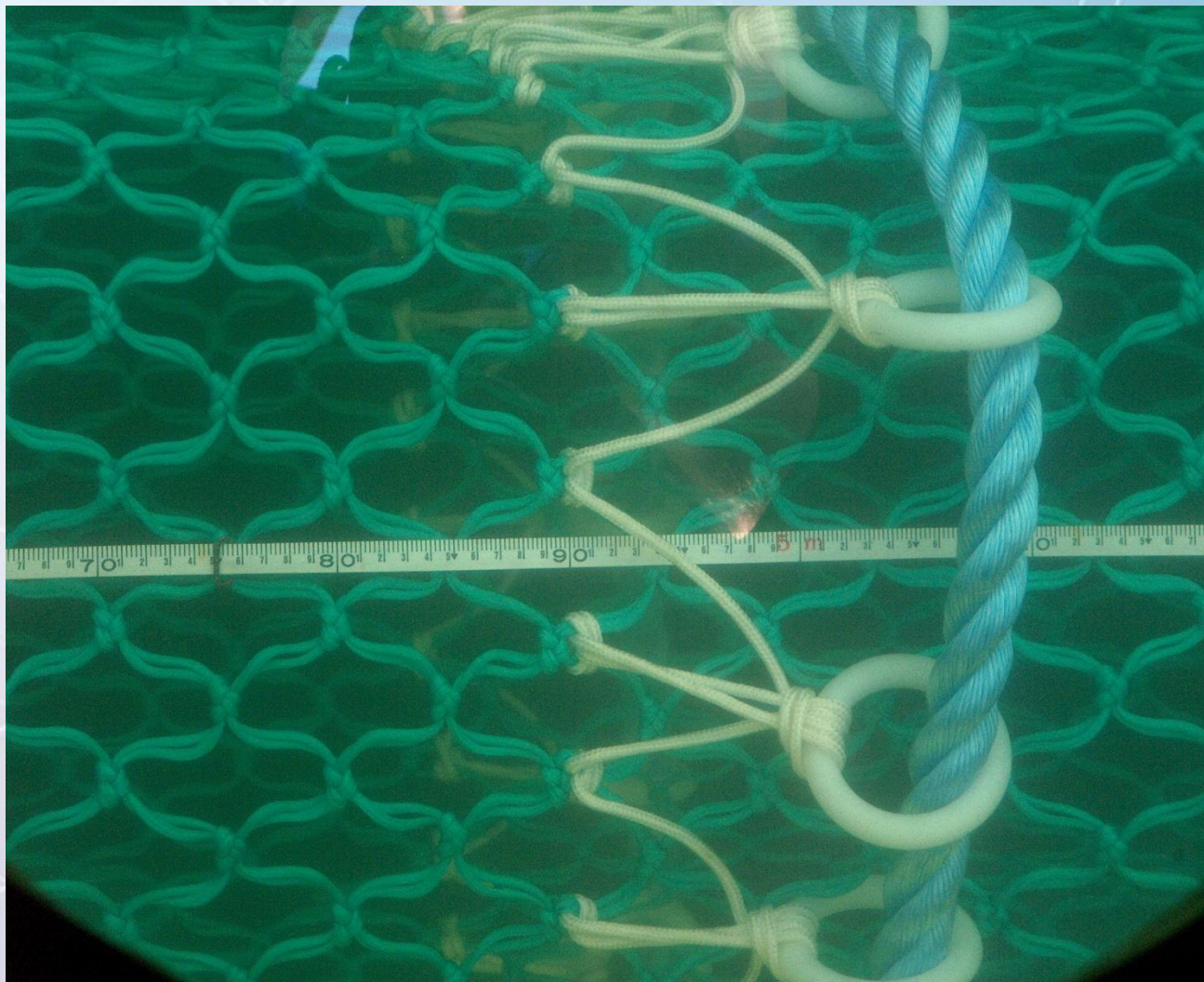


LIFiBS meeting
Berlin, November 18, 2010



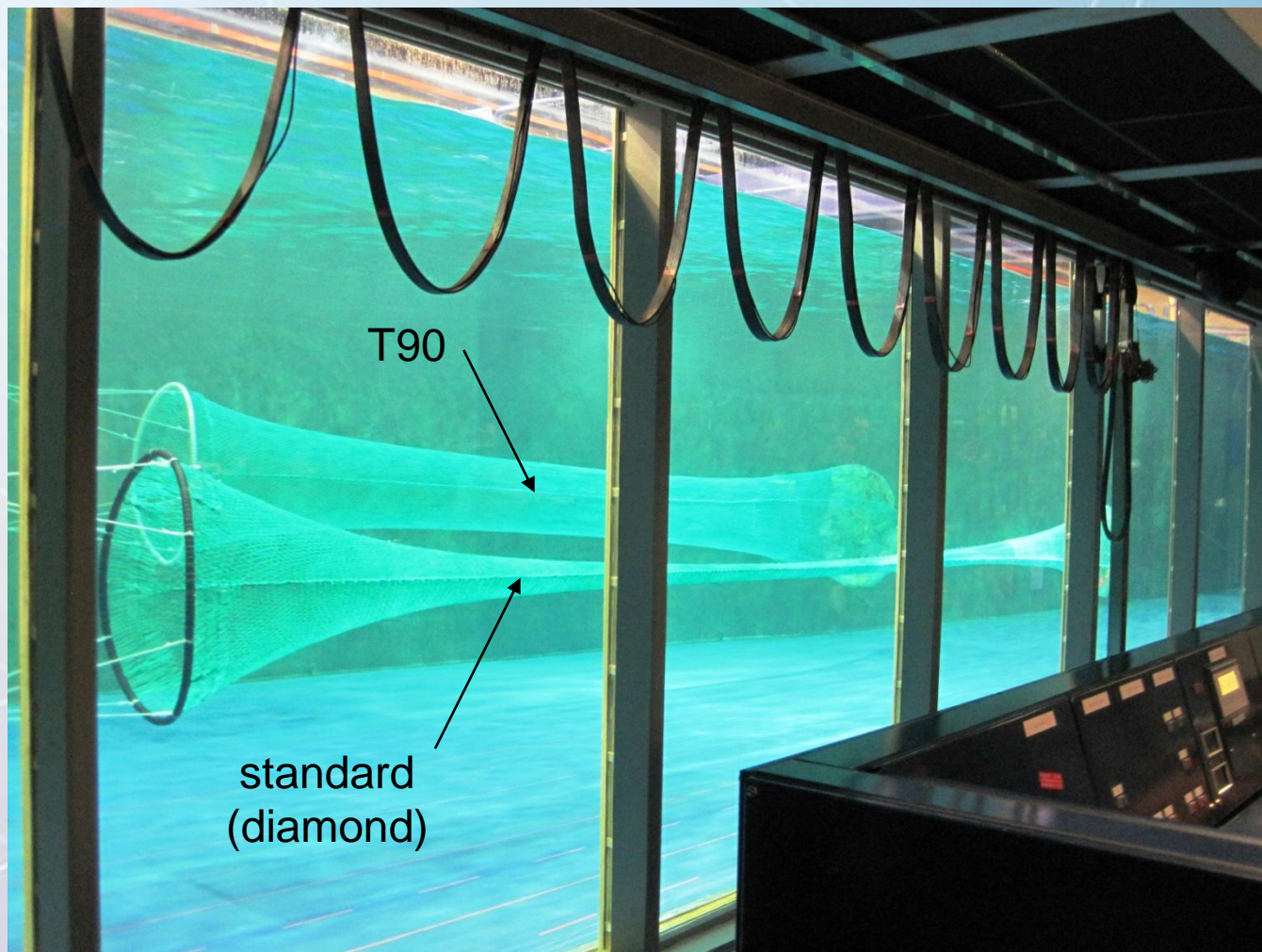
T90 codend's meshes shape of the commercial codend

(West Pomerian University of Technology, Szczecin, Poland)



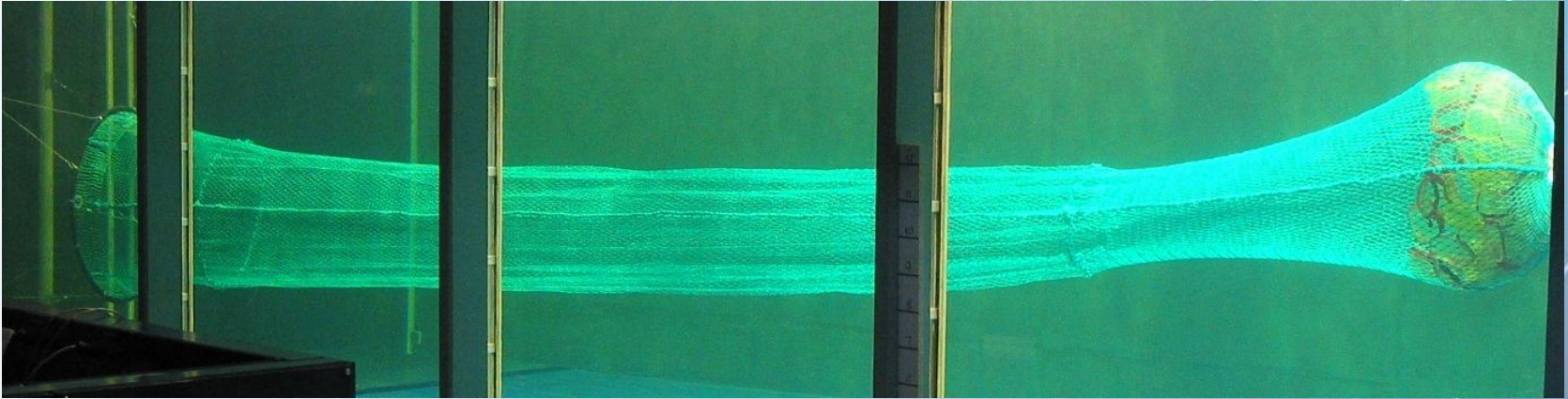


The shape of T90 and standard (diamond) codend - flume tank model study - *SINTEF* -



Model study of codends

T90 with T0 lifting bag



T0 - diamond





31.12.2005 EN Official Journal of the European Union L 349/1

**COUNCIL REGULATION (EC) No 2187/2005
of 21 December 2005**

**for the conservation of fishery resources through technical measures in the
Baltic Sea, the Belts and the Sound, amending Regulation (EC) No 1434/98
and repealing Regulation (EC) No 88/98**

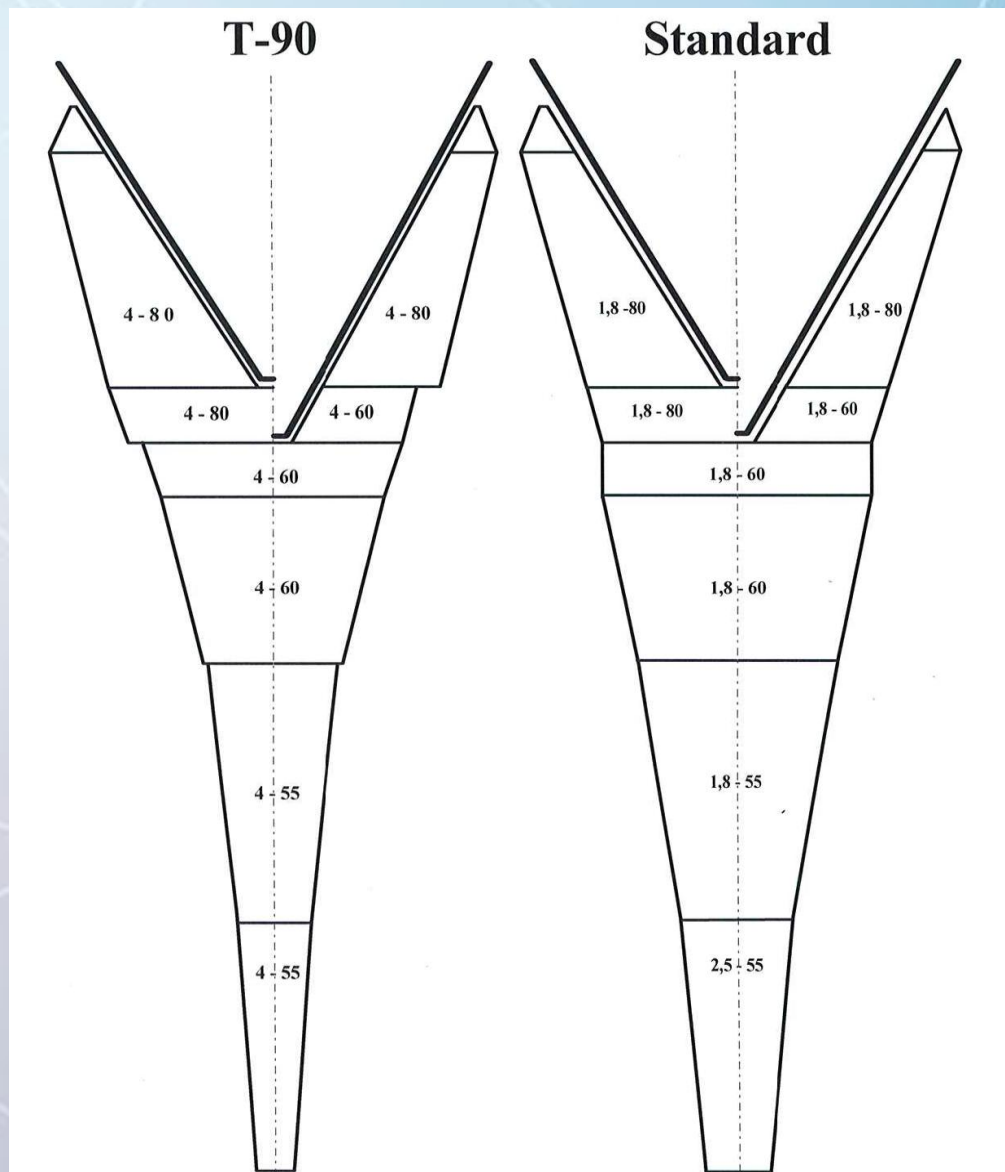


Selectivity investigation of T90 codend – *SOLEA* – double twine codend





Comparison of the shape of *T90* and *Standard* trawls of similar size





Shape of T90 trawl belly during flume tank investigation - *IFREMER* -





Model of T90 bottom trawl during flume tank investigation - *SINTEF*



LIFiBS meeting
Berlin, November 18, 2010



Shooting of the T90 cod trawl *Mod 35/31-T90* - BALTICA Sept. 2010 -



MORSKI
INSTYTUT
RYBACKI
W
GDYNI



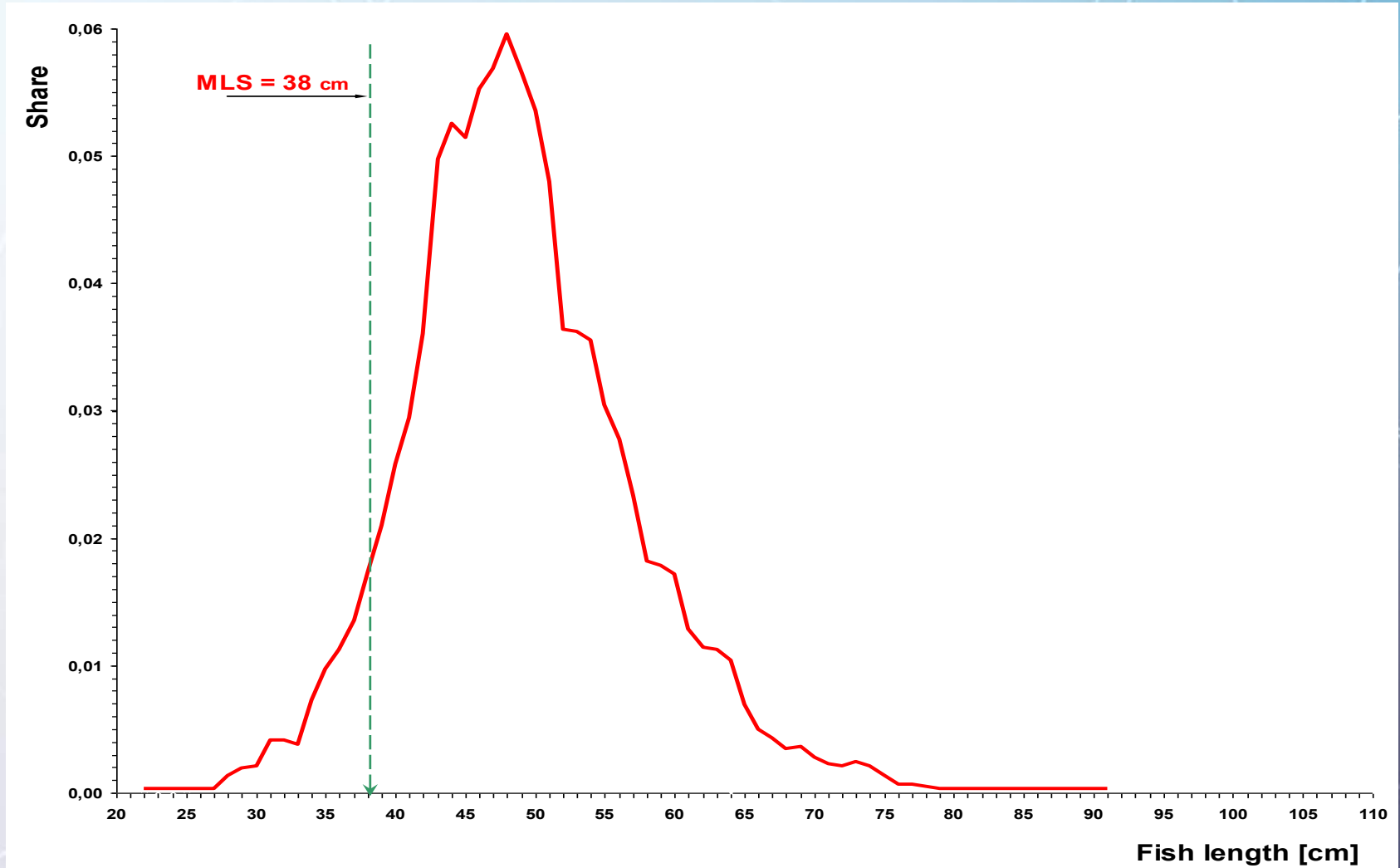


Catch of right size cod in T90 codend of the *Mod 35/31-T90* trawl - BALTICA Sept. 2010 -

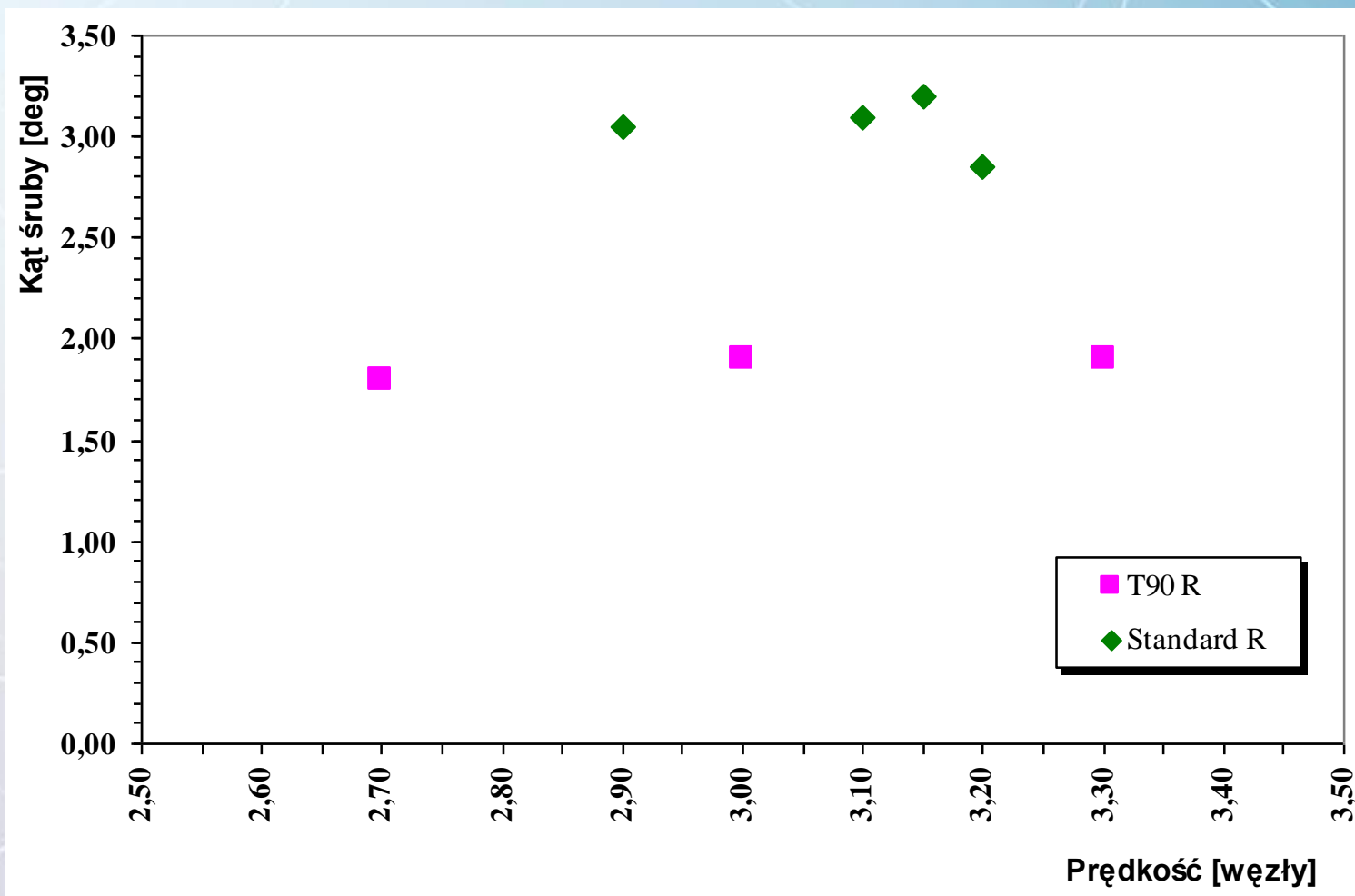




Length distribution of cod caught with T90 trawl – BALTICA Sept. 2010

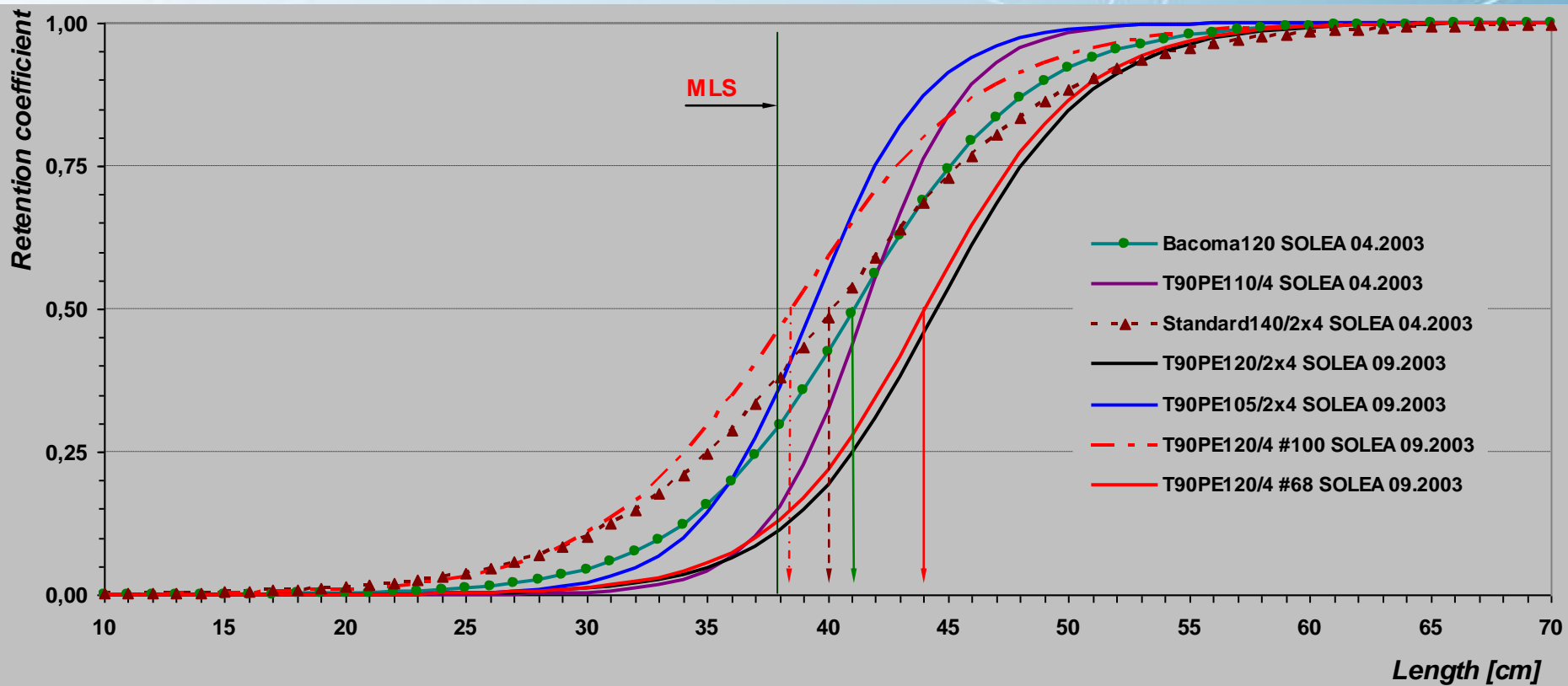


Angle of CPP blades vs. speed of vessel - BALTICA Sept. 2010 -



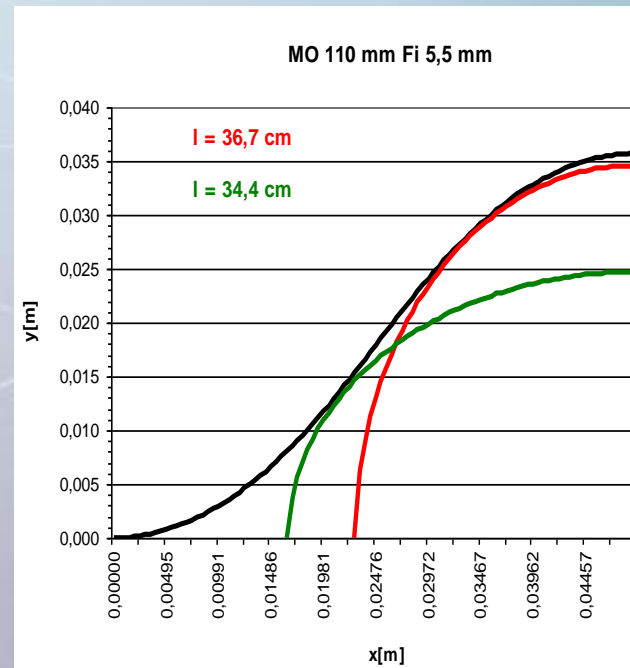
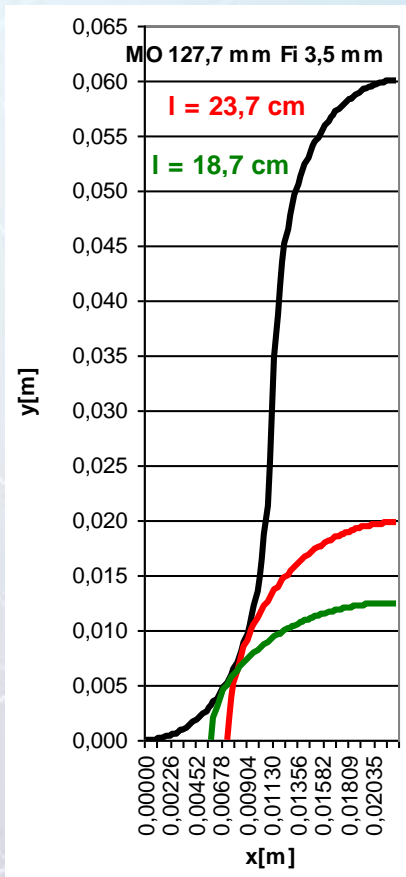


Selectivity of T90, T0 and Bacoma cod codends



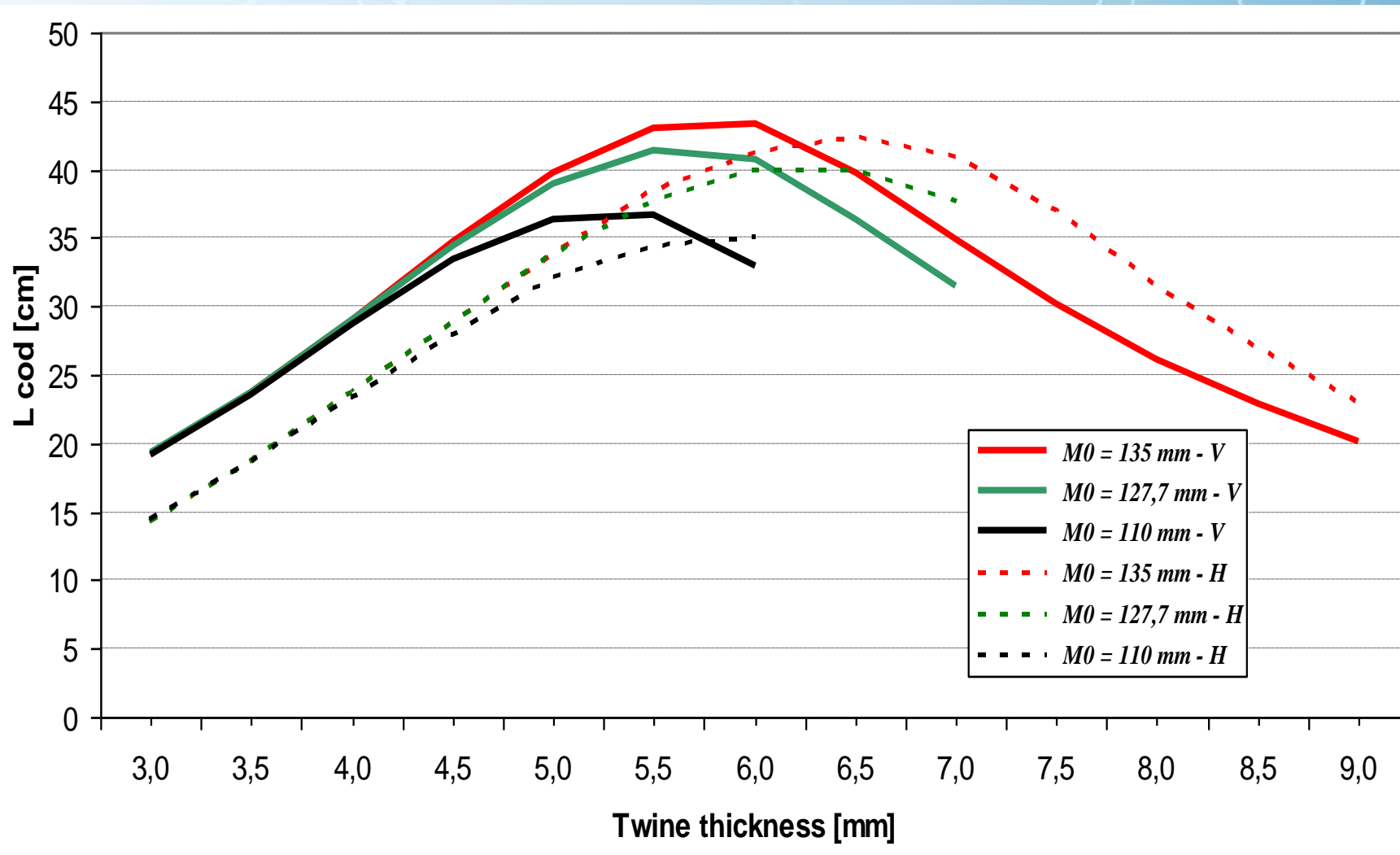


Finding a length of cod that is able to escape from a T90 mesh





Length of cod escaped vs. twine thickness - T90 codends, calculation -





Advantages of T90 meshes

- very good selective and protective properties of T90 codends (sharp selective curve, small by-catch and discard)
- better fish condition and thus survive rate of fishes
- better quality of fish caught
- bigger diameter of codend – more room for fish
- improved catch abilities (catch rate)
- less fuel consumption of T90 trawl – less air pollution
- “clear” fishing, less work for a crew
- stability during whole towing
- short fishing operation time
- simple construction of T90 codend
- low price of T90 codend
- better breaking strength of turned netting
- easy netting availability
- difficult to manipulate to reduce selectivity
- low impact of T90 trawl gear onto the bottom – light rigging



Thank you for your attention