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Draft guide
Verifying fish quantities in fishing vessel holds - volumetrics method

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TOOLS FOR HIGH SEAS BOARDING AND INSPECTIONS

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Paper submitted by

France

Redactor: François AMAUDRIC DU CHAFFAUT
Email: francois.amaudric-du-chaffaut@mer.gouv.fr

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Draft guide
Verifying fish quantities in fishing vessel holds - volumetrics method

INTRODUCTION

This procedure is intended to guide inspectors in estimating the quantities of fish on board, when direct weighing or weighing by sampling is not possible.

Volumetrics is a method for measuring a space—typically a ship's hold—to estimate the volume of fish stored, expressed in cubic metres (m^3). The volume of fish can be translated in a weight after applying several factors.
It allows fisheries officers to estimate the weight of the catch on board and verify catch declarations, especially :
  ➢ When there is a suspicion of underreporting or false catch declarations.
  ➢ If the vessel identity or license status is unclear.
  ➢ To cross-check logbooks with physical evidence.

Even if not highly precise, this method reveals significant discrepancies in declared versus actual fish quantities. It can be a trigger conducting to a more extensive and precise method such as sampling, or full discharging and weighting at port.

METHOD IMPLEMENTATION

Ideally, two officers are involved:
  · one reviews the logbooks and interviews the master for species, product types, and estimated catch; he can refer to:
    ◦ vessel plans
    ◦ stability book
    ◦ hull survey certificates
  · the other performs physical measurements of each fish hold.

PROCEDURAL STEPS

Step 1 – Information Gathering
- Interview the captain about species, product condition, and storage method.
- Review onboard documents: fishing logbook, vessel plans, stability certificate.

Step 2 – Measuring the hold
Use internal dimensions only: Volume (m3) = Length × Width × Height.
For irregular shapes: Triangular volume = (L × W × H) ÷ 2. *(see annex 1)*

Step 3 – Estimate fill rate
To obtain the fill rate of the hold and estimate the fish volume, either:
- measure the volume occupied by the fish in the hold, or
- measure the free air space in the hold and deduct it from the total volume of the hold.

Step 4 – Apply density factor
Average density for whole fish in bulk: 1080 kg/m^3
Examples (FAO and ICCAT sources):
 - Marlin (MLS): 1080 kg/m^3
 - Bigeye tuna (BET): 1065 kg/m^3
 - Pacific bluefin tuna (PBF): 1070 kg/m^3
 - Albacore tuna (ALB): 1050 kg/m^3
 - Skipjack tuna (SKJ): 1030 kg/m^3
 - Swordfish (SWO): 1075 kg/m^3

Step 5 – Apply Processing Conversion Factor
Apply if fish is processed.
Examples:

Species (FAO code)	Whole	Gutted	Gutted + Head off
Marlin (MLS)	1.00	1.10	1.30
Bigeye tuna (BET)	1.00	1.13	1.33
Pacific bluefin tuna (PBF)	1.00	1.14	1.34
Albacore tuna (ALB)	1.00	1.12	1.31
Skipjack tuna (SKJ)	1.00	1.10	1.28
Swordfish (SWO)	1.00	1.10	1.30
Sharks (CWZ)	1.00	1.10	2.00
Yellowfin tuna (YFT)	1.00	1.16	1.36

Step 6 – Apply Stacking Factor
Factors depending on stacking method:
- Loose: 0.45
- Medium (e.g. tuna): 0.51
- Tight: 0.54

Step 7 – Compare With Onboard Records
Compare the result with the fishing logbook, captain's declarations, and landing data.

Example Calculation
Hold: 8 × 8 × 2.5 m = 160 m^3
Fill rate: 70%
Species: Bigeye tuna (BET), gutted
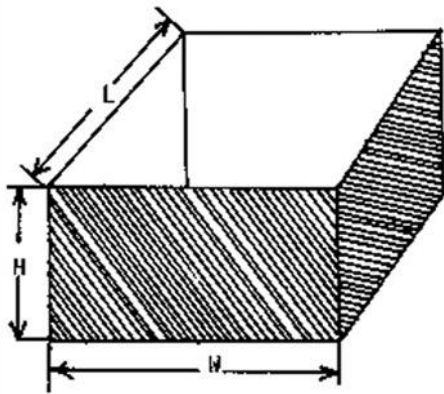Density: 1065 kg/m^3
Stacking factor: 0.51
Processing factor: 1.13
Usable volume: 160 × 0.7 = 112 m^3
Gross weight = 112 × 1065 = 119,280 kg
Stacked weight = 119,280 × 0.51 = 60,832.8 kg
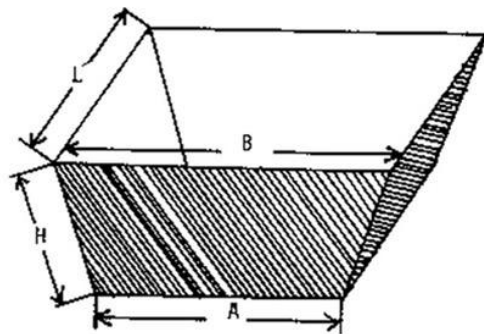Catch weight = 60,832.8 × 1.13 = 68,741 kg ≈ 68.7 tonnes
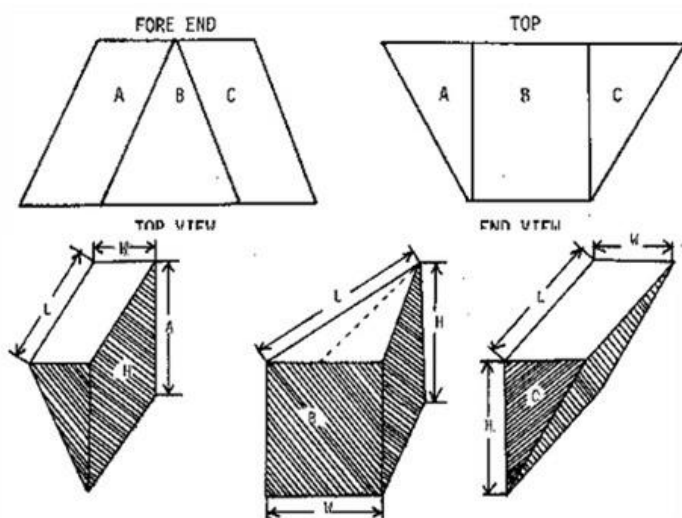
Annex 1. Calculating volume formulas
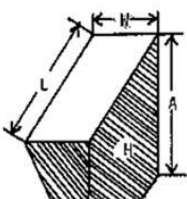

Volume = length x width x height
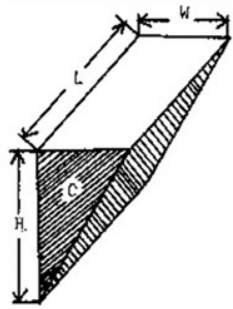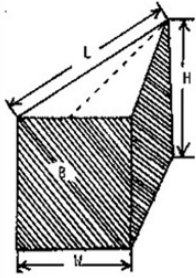

Volume = (width A+width B)
x length x height /2

To calculate the size of these holds you need to separate them into a shape you can measure and then use the below formulas.

Total area in metre^3 = VA + VB + VC

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$$VA = \frac{WA \times H \times L}{2}$$

$$VC = \frac{WC \times H \times L}{2}$$

$$VB = \frac{WB \times H \times L}{2}$$