

Rijksinstituut voor Visserijonderzoek

Afdeling Technisch Onderzoek

Netherlands Institute for Fishery Investigations

Technical Research Department

**Voerontwerp 16 m hektrawler
voor Tanzania**

F. de Beer

Rappert no. 72 - 1

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2755331

Benaming			
	Schaal	Gecontroleerd	Formaat A4

VOORONTWERP 16 M HEKTRAWLER

Ontwerpeisen

Langte over alles: ± 16 m
Visruim : ± 8 ton vis (stortlading)
 ± 2 ton vis (keallading)
Vaargebied : Lake Victoria, Tanzania (Oost-Afrika)
hoogte meer : 1200 m
watertemperatuur : 25°C
omgevingstemperatuur : $30 - 35^{\circ}\text{C}$
relatieve vochtigheid: $\pm 80\%$
Vermogen : 150 APK
Brandstof : $\pm 2\frac{1}{2}$ ton
Drinkwater : ± 1 ton
Bemannig : 4

Berekening

Brandstof : aantal dagen: 3 à 4
verbruik 27 kg/uur
brandstofcap. $0,027 \times 24 \times 4 = 2,59$ ton
reserve 0,91 ton
brandstofcap. voor $3\frac{1}{2}$ dag 3,50 ton

Water : aantal dagen: 4
aantal personen: 4
verbruik 50 liter/mandag
watercapaciteit $0,050 \times 4 \times 4 = 0,8$ ton
stel watercapaciteit op 1,0 ton

Vernooëfficiënten: op 85% holte

$$C_b = \pm 0,48$$

$$C_m = \pm 0,80$$

$$C_p = 0,60$$

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Verhoudingen hoofdafmetingen:

verhouding L/B bij lengte van 14 t/m 20 m = 2,9 - 3,6.
stel L/B voor dit vaartuig voorlopig op $\frac{3,2}{2,9}$.

verhouding B/H bij lengte van 14 t/m 20 m = 1,7 - 2,1.
stel B/H voor dit vaartuig voorlopig op $\frac{1,85}{2,1}$.

Hoofdafmetingen:

lengte over alles 16,0 m

lengte waterlijn op 85% holte is dan $\pm 14,80$ m

breedte is $\frac{14,80}{1,7} = 8,625$ m \rightarrow $\frac{4,60}{2,1}$

holte is $\frac{4,60}{1,85} = 2,486$ m \rightarrow $\frac{2,50}{2,1}$

spantafstand 450 mm

lengte waterlijn (lengtestandaard) wordt nu $\frac{14,85}{2,1}$

Resumerend:

lengte over alles 16,00 m

lengte waterlijn 14,85 m

breedte 4,60 m

holte 2,50 m

Ruiminhoud

8 ton vis (stortlading)

stuwcoëfficiënt: 550 kg/m³

inhoud ruim $\frac{8000}{550} = 14,5$ m³ netto

2 ton vis (keellading)

stuwcoëfficiënt: 400 kg/m³

inhoud ruim $\frac{2000}{400} = 5,0$ m³ netto

totale inhoud 19,5 m³, stel $\frac{20}{2,1}$ m³

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Controle inhoud onderdeks

Totale inhoud is $L \times B \times H \times f = 14,85 \times 4,60 \times 2,30 \times 0,6 = 102,3 \text{ m}^3$ (incl. verhoging in dek).

<u>Onderdeel</u>	<u>Netto- inhoud</u>	<u>Faktor</u>	<u>Bruto- inhoud</u>
Brandstoftanks:			
MK SB	0,65	1,05	0,70
MK BB	0,65	1,05	0,70
AP SB	1,50	1,05	1,60
AP BB	1,50	1,05	1,60
Watertank	1,00	1,08	1,10
Ruin (stertlading)	13,9 ¹⁾	1,08	15,00
Ruin (hoellading)	7,3 ²⁾	1,10	8,00
Stuurmachinokamer			1,60
Netten store			3,50
Store			2,00
Veerpiek + achterpiek			2,50
Machinokamer			25,00
Accommodatie			19,00
Dubbels bodem			6,00
Diversen			10,00
Totaal			112,20

1) $\pm 0,6 \text{ m}^3$ te klein

2) $\pm 2,3 \text{ m}^3$ te groot

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Doodweight

Ruin homogeen beladen (stortlading)	$0,55 \times 13,9 = 7,65$ ton
Ruin homogeen beladen (koellading)	$0,40 \times 7,3 = 2,92$ ton
Brandstof 80%	2,80 ton
Water 80%	0,80 ton
Baliast	---- ton
Smeerolie 100%	0,50 ton
Bemannig + bagage	1,00 ton
Voorraden 90%	0,50 ton
Diversen (bijv. ijs)	1,00 ton
Totaal	17,17 ton

Gewicht leeg schip

Leeg schip = $L \times B \times H \times C_g$

Leeg schip = $14,85 \times 4,60 \times 2,50 \times 0,33 = 56,4 \text{ ton}^*$ (+ of - 10%).

*incl. visserijsuitrusting

Vertrik haven

Leeg schip	56,40 ton
Brandstof	3,50 ton
Water	1,00 ton
Smeerolie	0,50 ton
Bemannig + bagage	1,00 ton
Voorraden	1,00 ton
Diversen	1,00 ton
Totaal	64,40 ton

Diepgang gemiddeld $\pm 1,92$ m

Vrijboord 0,58 m

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Vertrek wiagrenden

Leeg schip	36,40 ton
Deadweight	17,17 ton
<hr/>	
Totaal	73,57 ton

Diepgang gemiddeld	+ 2,02 m
Vrijboord	0,48 m

Aanvangsstabiliteit (belading: vertrek wiagrenden)

$MK = MF + FK - GK$

$MF = \frac{e}{J} \cdot \frac{B^2}{T}; MF = \frac{0,054}{0,50} \cdot \frac{(4,60)^2}{2,02} = 1,14 \text{ m (e mit MF-diagr.)}$

$FK = a' \cdot \alpha \cdot T; FK = 0,79 \cdot 0,82 \cdot 2,02 = 1,31 \text{ m (a' mit FK-diagr.)}$

$\frac{+}{MK = 2,45 \text{ m}}$

$GK = \%H; GK = 78\%H$

$\frac{-}{GK = 1,95 \text{ m}}$

$\frac{-}{MK = 0,50 \text{ m}}$

Aanvangsstabiliteit (leeg schip)

$MF = \frac{e}{J} \cdot \frac{B^2}{T}; MF = \frac{0,052}{0,48} \cdot \frac{(4,60)^2}{1,75} = 2,53 \text{ m}$

$FK = a' \cdot \alpha \cdot T; FK = 0,80 \cdot 0,80 \cdot 1,75 = 1,12 \text{ m}$

$\frac{+}{MK = 2,41 \text{ m}}$

$GK = \%H; GK = 82\%H$

$\frac{-}{GK = 2,05 \text{ m}}$

$\frac{-}{MK = 0,39 \text{ m}}$

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Opmerkingen

- . Blokecoëfficiënt iets hoger; groter vrijboord
- . Zwaartepunt in hoogte moet iets omlaag; ballasten
- . Schip behoeft in eerste instantie niet breder; opbouw zeer licht construeren.

IJmuiden, 1972-01-20

F. de Beer

dBe/GV

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			A4	
Auteursrecht voorbehouden volgens de wet	Schaal	Gecontroleerd	Rangschikmerk	
	Getekend	Gezien		

**Specification of a 16 m
sterntrawler for Tanzania**

**Netherlands Institute for Fishery Investigations,
Technical Research Department, P.O. Box 68, IJmuiden.**

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	Geekend	Gezien	Berechthoud	

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SPECIFICATION OF A STEERTRAWLER

I General Description

The vessel to be built as a steel sterntrawler, according to the requirements and recommendations of the Netherlands Shipping Inspection.

The vessel has to operate under tropical conditions:

- . Lake Victoria 1200 m above sea-level
- . watertemperature 25°C
- . airtemperature 30° - 35°C
- . relative humidity of the air abt. 80%.

Special considerations have to be given to these conditions with regard to: maintenance, engine capacity, ventilation and insulation.

The vessel to be equipped for bottom- and midwatertrawling. Conversion to double beam trawling should be possible.

Trials to be held on the North Sea, including fishing trials. These trials have to fulfil the requirements of the owners or the Netherlands Institute for Fishery Investigations, acting on behalf of the owners and the Netherlands Shipping Inspection.

Delivery for shipment to Tanzania in Amsterdam or Rotterdam.

II Main particulars

Length overall	16.00 meters; 52'6"
Length standard (waterline at 85% of the depth)	14.85 meters; 48'9"
Breadth	4.60 meters; 15'1"
Depth	2.50 meters; 8'2"

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	Geekend	Gezien		Beschikmerk

Fish hold capacity (total)	20 cub.meters; 706 cub.ft.
Fuel oil	3½ tons
Freshwater	1 ton
Main engine	150 hp (under tropical conditions)
Accommodation	4

III Construction

The vessel to be built of mild steel and of an all-welded construction.

The hull to be divided into 7 compartments: fore peak, store, crew's accommodation, engine room, fish hold for iced fish, fish hold (bulk), net store and steering engine room.

The superstructure to be built of steel and wood. This superstructure is divided in a wheelhouse and a galley/dinette.

Keel flather 125 . 25 mm; connected to stem and stern; or an equivalent construction

Frames 65 . 50 . 6 mm or equivalent; frame spacing 450 mm

Floors at every frame, 7 mm plate

Deck beams 75 . 50 . 6 mm or equivalent; brackets 6 mm

Bulkheads lower strake 6½ mm, upper strake 6 mm; stiffeners 75 . 50 . 6 mm or equivalent, spaced 580 mm apart

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	Schaal	Gecontroleerd		
	Getuigd	Genoed		

Shellplating keelplates 7 mm, side plating 6 mm, bulwark 5 mm with stanchions of 6 mm

Deckplating deckplating 6 mm to be increased to 6½ mm in the way of tanks and 8 mm in the way of the gentries and the winch.

Where fittings are welded directly on the steel deck the plating is to be reinforced. Two longitudinal stringers of 150 . 65 . 8 mm.

The deck to be sheathed with 50 mm Yung. A flat margin bar of 50 . 7 mm to be welded on the deck. Seams to be caulked with oakum and filled with marine glue or an equivalent material.

The areas around the fittings (gantry, winch, etc.) to be filled with cement if necessary.

Stem the stem of a welded construction; stem plating 8 mm

Stern the stern of a welded construction or an equivalent construction

Tranzen the tranzen of 8 mm plating; suitable stiffened and supported above and below deck

Bilge keels bulbplate 140 . 7 mm on each side, welded to the shellplating; length about 5 meters

Freeing ports three balanced freeing ports fitted in the bulwark on the aft-deck (working deck) on each side

Bellards bellards to be placed on the fore- and aft-deck

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	Gegevens	Gegevens	Bevestigingsmerk	

Deck hatches

the fish hold hatches and the net store hatch; size 800 . 800 mm, 350 mm in height. Coamings and hatchcovers of 6 mm steel.

Pore peak hatch 500 mm around, 350 mm in height. Coaming and hatchcover of 6 mm steel.

The steering engine room hatch to be constructed flush in the deck; size 800 . 800 mm.

Skylight

skylight over the crew's accommodation of 6 mm plate with a hinged steel cover with two bull eyes of 8" diameter

Rudder

rudder to be of the double plate balanced type and suitable stiffened. Rudderstock of mild steel; the top of the rudderstock arranged to suit the steering arrangement

Superstructure

the superstructure to be made of 5 mm steel plating, stiffeners of flat bars 60 . 6 mm. It has to be possible to dismount the superstructure due to transport to Tanzania. The engine room entrance, on starboard side of the superstructure, has to be arranged by means of a wooden door and a steel hatch in the deck; coaming 350 mm. The toilet entrance, on portside of the superstructure, has a wooden door with a coaming 350 mm. A handrail of 1½" pipe to be fitted around the sides and the front of the superstructure. The winch is included in the aft-part of the superstructure.

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	Schaal	Gecontroleerd	A4	
	Gegevens	Gegevens	Beoordeling	

The top of the superstructure to be of Yang 35 mm with steel stiffeners.

IV Arrangement

Store

the fore peak store is accessible by steel steps. Floor of white wood 22 mm

Chain locker

chain locker of 6½ mm steel plating. A grate to be fitted

Crew's accommodation

the crew's accommodation to be arranged for four men. Sufficient lockers for personal belongings. Walls lined with plastic plates or an equivalent material. Floor of 35 mm Yang; staircase to be of hard wood.

Fresh water tank

the fresh water tank with a capacity of 1000 liters, constructed into the vessel and fitted with all necessary vents, fillers and inspection manholes.

The tank inside cement washed.

A small fresh water daily service tank of about 80 liters to be fitted in the superstructure, with handpump and inspection cover. The tank inside cement washed.

Wheelhouse

the wheelhouse is the fore part of the superstructure.

Windows of securit glass fastened in copper frames or an equivalent construction.

In all sides of the superstructure at least two windows which can be opened.

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	Schaal	Gecontroleerd		
	Gebruik	Gebruik		

Provisions to be made for fitting the necessary equipment. The entrance to the wheelhouse (superstructure) on starboard and portside by means of mahogany (or an equivalent material) doors.

The wheelhouse lined with plywood or an equivalent material; floor of Yang 35 mm. The winch controls are at the aft-side of the superstructure.

Galley/dinette on starboard side of the superstructure a stainless steel sink with lockers underneath should be installed. A gas stove for cooking to be installed and a 24 V refrigerator of about 100 liter to be installed.

On portside of the superstructure a bench with a plastic topped table to be fitted. For windows, walls, ceiling and floor: see Wheelhouse.

Toilet a toilet with waterflow to be installed on portside of the superstructure. Walls of 3 mm steel plating; floor cemented with tiles.

Engine room the engine room be insulated where necessary. Floor plates to be fitted. Entrance from the deck by means of a steel staircase. An emergency exit to the wheelhouse to be constructed on portside.

Two fuel oil tanks to be constructed with a total capacity of about 1,3 ton. The tanks to be provided with all necessary vents, filters and inspection manholes. Tanks connected to each other with a levelling pipe.

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Schaal	Gecentreleerd		
Getuigd	Getuigd	Aanbeveling	

A daily service tank of about 300 liter shall be supplied, completely with hand pumping arrangement and gauge and drain.

A lubricating oil tank of about 200 liter to be fitted in the engine room, with drain, inspection cover, filling pipe, gauge and tap-valve.

Fish holds

the fish hold for iced fish has a capacity of about 7 m³ (247 cub.ft.). The hold to be lined throughout and sufficiently insulated. The hold to be divided in two ponds by means of wooden boards.

Access ladder to the aft-side of the hatch.

Flooring of cement; a waterway to be arranged.

The fish hold for bulk has a capacity of about 13 m³ (459 cub.ft.). The hold to be sufficiently insulated, and divided in four ponds.

Flooring of cement; a center waterway should be arranged and a slush well fitted aft for drainage.

The insulation of the fish holds will be according the requirements of the Institute for Fishery Products T.N.O. at IJmuiden, The Netherlands.

Net store

net racks and steel ladder to be fitted. Floor made of white wood of 22 mm.

Fuel oil tanks (see also Engine room).

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		A4	
Schaal	Gecontroleerd	Bereikbaarheid	
Gebruik	Code		

Steering engine room

the steering engine room to be accessible by steel steps.

Floor of white wood of 22 mm.

V Equipment

Anchor and anchorchain

the anchor and anchorchain will be according to the requirements of the Netherlands Shipping Inspection.

A hand anchorwinch of sufficient capacity to be placed on the fore-deck.

Trawl winch

trawlwinch with four drums driven by the main engine by means of a flat belt using a straining pulley. Warpdrum capacity of 300 meters on each drum. Diameter wire rope of 14 mm. Pull 3 tons at half drum diameter. Hauling speed min. 30 m/min. The winch is fitted out with two warping heads. The winch controls are fitted at the aft-side of the superstructure. The winchdrive and -installation need the approval of the Netherlands Institute for Fishery Investigations.

Gantries and rigging

a mast (gantry) for general purpose to be placed amidship.

Gantry construction for main engine exhaust and engine room ventilation.

Two derricks to be fitted for loading and unloading the holds and net store.

The mast to be equipped with the necessary gear and blocks.

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Getekend	Getoet	Bereikbaarheid	

A gantry for fishing purposes to be placed on the aft-deck, to be equipped with the necessary gear and blocks for bottom- and midwater trawling.

Warp blocks and blocks for hoisting the cod-end to be fitted.

The entirely fishing gear arrangement needs the approval of the Netherlands Institute for Fishery Investigations.

Steering

the steering installation to be of hand or hand hydraulic, of approved make and type. Emergency tiller should be supplied.

Ventilation

the ventilation for the accommodation should be natural. A 24 V ventilator of sufficient capacity should be installed for the engine room. Special attention must be paid to the ventilation of the crew's accommodation and the engine room.

Navigational equipment

two vertical echosounders, make "Furuno"; type: in accordance with the owner.

A radar installation, make "Decca"; max. range 16 miles; type: in accordance with the owner.

A radio-telephone installation, make and type "Mareoni" CH 25.

Awning

a sun awning to fit on the fore-deck.

Ponds
(on working deck)

the aft-deck near the fishing gantry to be arranged for ponds.

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Schaal	Gecontroleerd		
Getuigd	Getuigd	Bereikbaarheid	

Horn

an electric horn is supplied and fitted on the top of the wheelhouse.

Searchlight

a searchlight is supplied and fitted on the top of the wheelhouse.

VI Propulsion and machinery

Main engine

the main engine is a "Caterpillar" D 333, which delivers 190 bhp, at 2000 rpm continuous rating and fitted with a 4,5 : 1 ratio reduction drive (twindisc ME 509). The engine is cooled by means of a keel cooling conversion (capacity for tropical conditions). The engine is electrically started by 24 V starters. The starter push button is fitted in the wheelhouse.

The engine drives:

- . a D.C. generator 24 V, 50 A (2 sets of batteries, cap. 200 AMP/hour each)
- . the trawl winch by means of a flat belt
- . a combined bilge and deck washing pump by means of a V-belt.

The engine is equipped with various controls like:

- . cooling water thermometer
- . high cooling water temperature warning
- . mechanical tachometer with hour counter
- . oil pressure meter
- . low oil pressure warning

The instrument panel with controls is fitted in the wheelhouse.

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Exhaust

the main engine exhaust to the gantry is fitted with a suitable dry type silencer. The silencer is connected to a short length of flexible pipe and has to be adequately insulated.

Propeller-shaft

of best quality steel; diameter according to the rules of the Netherlands Shipping Inspection.

Stern tube

made of steel

Propeller

a fixed pitch propeller to be installed; diameter about 1.10 meter; material "enual". A calculation should be made for the exact dimensions of the propeller. An extra propeller should be delivered; material in accordance with the owner.

Piping

bilge pipe lines to every watertight compartment, connected to a distributing box, situated in the engine room. The fish holds to be provided with extra bilge pipe lines and a handpump. The fuel and lubricating oil pipe lines have to be fitted out to the requirements of the Netherlands Shipping Inspection. Dimensions according to the requirements of the Netherlands Shipping Inspection.

Pumps

(see: Main engine)

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VII Electrical installation

A 24 V D.C. electrical installation to be installed according to the requirements of the Netherlands Shipping Inspection.

Two sets of batteries to be placed; capacity of each set 200 AMP/hr.

Ship's lighting

crew's accommodation : 2 lamps
engine room : 4 watertight lamps and 1 portable lamp complete with cable of sufficient length
wheelhouse : 1 watertight lamp
1 compass light
1 lamp over chart-table
galley : 1 watertight lamp
dinette : 1 watertight lamp
toilet : 1 watertight lamp
fish hold (iced fish) : 1 watertight lamp
fish hold (bulk) : 2 watertight lamps
net store : 1 watertight lamp
steering engine room : 1 watertight lamp
deck lighting : 2 watertight lamps in the gantry

Navigation-lamps

1 port- and starboardlight
1 steaming light
1 sternlight
1 anchorlight
1, allround fishing lamp

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VIII Painting and preserving

All steel work, interior and exterior free from mill scale and rust; thoroughly cleaned before any system is applied. Systems should be suitable for tropical conditions. (Lake Victoria: fresh water.)

Cathodic anodes to be fitted to the hull and the rudder.

IX Inventory

The nautical and safety inventory according to the requirements of the Netherlands Shipping Inspection.

Spare parts for the main engine and other installations according the requirements of Lloyds Register of Shipping and/or Veritas.

A liferaft to be fitted for four persons according to the requirements of the Netherlands Shipping Inspection.

X Miscellaneous

Transport

A number of special provisions has to be made, because of the transport of the vessel to Tanzania and the transport from the coast to Lake Victoria.

The light weight of the vessel may not exceed 50 tons; therefore it should be possible to dismantle the superstructure and the gantries.

A cradle must be constructed in accordance with the specifications of shipping company and transport (land) company.

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Calculations

The following calculations should be made:

- . weight calculation (in behalf of the transport)
- . hydrostatic curves
- . stability calculation
- . towing pull and propeller calculation

Tools

Tools to be supplied in co-operation with the owner.

Drawings and manuals

Drawings and manuals in the English language (in duplicate).

Fishing inventory

The fishing inventory does not belong to this specification.

IJmuiden (the Netherlands), 1972-01-28.

dBe/GV

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Scheel	Gecontroleerd		
Gepland	Gevoerd	Bepaald	