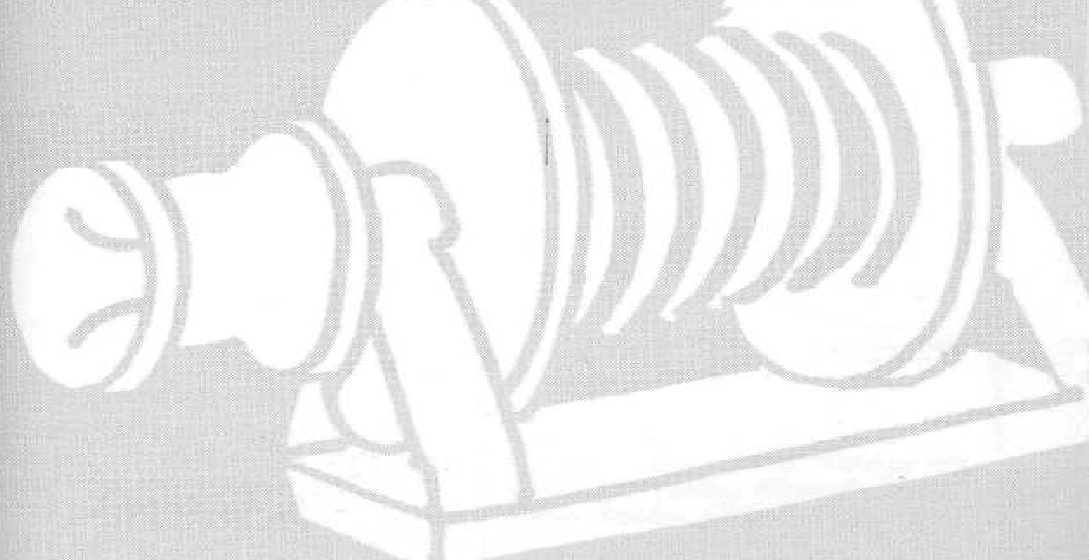
Equipment for deck and wheelhouse



Fishing with light

■ Conditions which favour fishing with light

	Not favourable	Average	Favourable
Colour of the Sea	Brown-yellow	Yellow-Green	Green-Blue
Transparency (visibility m)	0 to 5	5 to 10	10 to 30
Moon phase	Full	-	New
Current	Strong to Medium	Medium to Weak	None

■ Type of Lamp and utilization

	Petrol (gasoline) or liquified gas	Electric
Advantages	inexpensive easy to maintain and use	effective above the surface or in the water
Disadvantages	fragile used only above the water	expensive heavy bulky batteries or generators

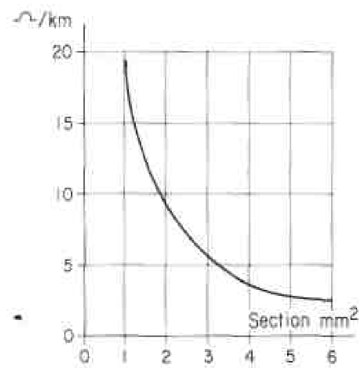
It is better to use several lights of moderate intensity, sufficiently spaced apart, rather than a single light of strong intensity.

When a lamp.is mounted above the surface, only half its light effectively penetrates the water, due to reflection from the surface.

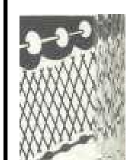
■ Resistance of electric cables

Running lamps with low voltages (for example, 12-24 V) may involve significant power losses through conducting wires. Therefore, wires used with low voltages should be thicker than those needed for higher voltages.

Resistance to a continuous current (in ohms/km) in a copper conductor is a function of the cross section area of the cable (mm²).



From Ben-Yami, 1976. *Fishing with light.* FAO Fishing Manuals, Fishing News (Books), Oxford.



Characteristics of echo-sounders

Depth Range
Frequency Common frequencies are 30-400 KHz

	High Frequency Echo-sounders (100 to 400 kHz)	Low Frequency Echo-sounders (50 kHz or less)
Common use	shallow water	deep water
Width of Beam	narrow	wide
Precision	very good	less precise
Size of transducer	small	large
Usual Use	fish detection	navigation

Electric supply required on the vessel (voltage, power)
If the echosounder's power supply is a bit weak, its performance will be poor.

The type of display may be lamp display (flasher), paper (chart recorder), or colour screen.

	Paper display (dry, black and white)	Television type display (colour)
Advantages	paper record may be kept	different colours may indicate very small differences in strengths of echoes
Disadvantages	differentiation of different echo strengths is limited (shades of black and grey) cost of Recording Paper	no memory or limited memory, but note that recording equipment is now available

■ **Other predetermined characteristics**

Wavelength (m) = 1500/frequency (Hz)
The smaller the wavelength the greater the precision of detection.

Pulse length :
Short 0.1 to 1 millisecond
Long more than 2 milliseconds
The shorter the pulse length, the greater the precision but, in fact, this is predetermined according to the frequency and the depth of sounding.

Beam-width :
Wide : 20 to 30 degrees
Narrow : 4 to 10 degrees

Output power ranges from 100 to 5000 watts.
The greater the power, the better will be the strength and precision of detection.

Choice of an echo-sounder according to the application

	Navigation echosounder	Fish-finding echosounder
Depth of Water Limited to 100 m	Frequency 20-100 kHz Beamwidth 10-20 degrees Output Power less than 1 kW	Frequency 100-400 kHz Beamwidth 4-15 degrees Output Power around 1 kW
	Pulse length less than 1 millisecond Flasher display may be sufficient	Pulse length less than 1 millisecond Usually with TVG and whiteline
Deeper Water	Frequency 10-20 kHz Beamwidth 4-10 degrees Output Power 5 -10 Kw depending on depth Pulse length greater than 2 milliseconds	Frequency 30-50 kHz Beamwidth 4-10 degrees Output Power 5-10 kW depending on depth Pulse length 1-2 milliseconds, with TVG and whiteline

Winches and net drums

■ **Power required**

$$P = \frac{(F \times v)}{75}$$

where

P = actual power of winch or hauler (HP)

F = pulling force needed (kgf)

v = speed of hauling needed (m/s)

When estimating the engine power required to produce the actual power at the winch, it is necessary to add 25% for power loss through mechanical transmission, or 100% for hydraulic transmission. For example, if actual winch power (P) of 10 HP is required and transmission is mechanical, then 12.5 HP engine power will be needed to produce this.

■ **Turning speed required**

$$R \sim \frac{1000 \times v}{3 \times \varnothing}$$

where

R = turning speed of winch or hauler **(RPM)**

v = speed of hauling required (m/min)

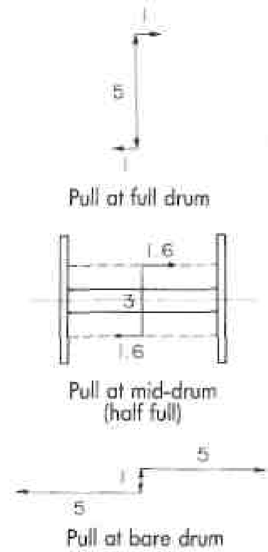
Ø = diameter of full drum (mm)

■ **At a constant hauling speed, pulling force available decreases as a drum fills**

Pulling force

$$= \frac{\text{torque}}{\text{effective diameter of drum}}$$

The torque of the drum is constant (at 5, in the example in next column).



■ **At a constant drum diameter, the pulling force available decreases as speed increases**

Work done by drum = pull x speed = constant

***Example**:*

pull at mid-drum at 1 m/s : 1.6 t
pull at mid-drum at 1.6 m/s : 1.0 t
(1.6 t x 1 m/s = 1.0 t x 1.6 m/s)

■ **Tension on the material being hauled**

$$T = \frac{75 \times P}{v}$$

where

T = tension on the material (kgf)

P = power of the winch or hauler (HP)

v — speed of hauling (m/s)

Note : *Main characteristics of a winch or drum are the dimensions, the capacity and the pulling force (in tonnes force or in daN; see pages 150. 152)*

purse seine winches and drums

The pulling force of the purse line winch required for a seine of given weight can be estimated by the following formula :

$$F = 4/3\ (Wn/2 + Wr + Ws)$$

where :

F = pulling force of the winch (tf, tons force)

Wn = weight in air of the netting (t, tons)

Wr = weight in air of the footrope and purse rings (†)

Ws = weight in air of the ballast on the footrope (†)

Characteristics of some purse line winches in use (after Brissonneau and Lotz)

		Drum Capacity				
Vessel Length (m)	No. Drums	Cable Ø (mm)	Length (m)	Pull (†) (bare drum)	Speed (m/s) (bare drum)	P(HP)*
20	2	15.4	1300	8	0.5	44
20-25	2	15.4	1800	11	0.42	70
25-30	2	17.6	1800	17	0.37	100
30-40	3	17.6	1800	21	0.30	
		17.6	800	21	0.30	100
		17.6	600	21	0.30	
45-60	3	20	2220	27	0.35	
		20	975	27	0.35	150
		20	975	24.5	0.35	
60-75	3	22	2420	27	0.35	
		22	1120	27	0.35	300
		22	1120	24.8	0.35	

■ **Seine drums**

some examples

width of drum inside flanges (m)	3.00	3.90
flange diameter (m)	2.45	2.44
drum diameter (m)	0.6	0.45
Seine dimensions: hung length x stretched height (m)	360 x 30	450 x 64
stretched meshsize (mm) (centre section)	32	
twine size (centre section, Rtex)	376	

* *Power (HP) = 1.36 x Power (kW)*

Trawl winches

Power* of trawler(HP)	Power of winch(HP)	Capacity of drums		hauling speed (m/sec)	Pull at mid-drum (kg) drums combined
		Length(m)	Ø of wire(mm)		
50-75	200	6.3	500-750		
100	25	700	10.5	1.00	900
200	40	1000	12.0	1.20	1600
300	60	1250	13.5	1.35	2500
400	80	1350	15.0	1.40	3500
500	120	2100	16.5	1.50	4500
700-800	165	2000	19.5	1.50	6500

** Brake horsepower (BHP) or Apparent Nominal Power (ANP), see page 95 Power in (HP] = 1.36 x Power in (kW)*

At constant drum RPM, pull x diameter = constant; thus,

$$\text{pull at bare drum} = \frac{\text{pull at mid-drum} \times \varnothing \text{ at mid-drum}}{\varnothing \text{ at bare drum}}$$

$$\text{pull at full drum} = \frac{\text{pull at mid-drum} \times \varnothing \text{ at mid-drum}}{\varnothing \text{ at full drum}}$$

■ Performance

— Power :

$$\text{Power of winch (HP)} = \frac{\text{Power of engine (HP)}}{4 \text{ or } 5}$$

— Maximum Pull : At the most, equal to 1/3 the breaking strength of the warp.
In order to haul the trawl the winch has to develop more power than tha' which is exerted in towing the trawl.

The pull of the winch at mid-drum should be at least 80% of the maximum bollard pull of the vessel. It is best to use the formula :

Pull of the winch (at mid-drum)
= 1.3 x pull of the trawler

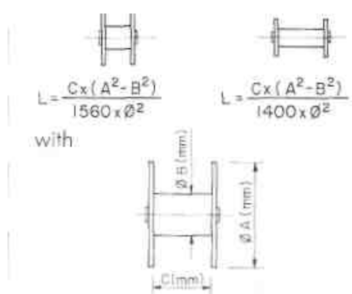
■ Dimensions

— Diameter of the bare drum : about 14 to 20 times the diameter of the warp.

— Depth of drum$\frac{(A - B)}{2}$: at least equal to the diameter of the bare drum

■ Capacity of a winch drum

— With automatic spooling (level-wind) and drum dimensions given above, If L = length (m) of warp, and 0 = diameter (mm) of warp :



— Manual spooling reduces this capacity by about 10%.

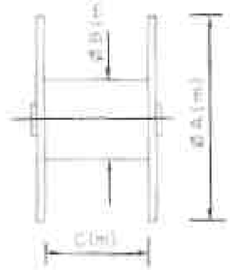
Note : *Tolerances must be taken into account when accessories (i.e. chains, shackles) swivels] are hauled on with the warps.*

Trawl net drums

■ **Capacity of a drum**

Usable volume of drum

(m^3) = 3 x C x (A^2 - B^2)]

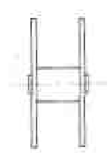


Note : *The volume of a trawl (V) con be estimated from its weight W: midwater trawl V (cubic m) = 3.5 X W (tonnes) bottom trawl V (cubic m) = 4.0 x W (tonnes)*

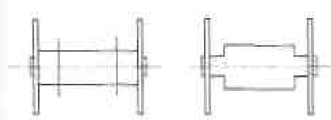
Note : *when sweeps and/or the bridles of combination rope are to be reeled onto the drum with the net, their volume must be taken into account. The same is true for the floats, ballast, sinker chain and bobbins.*

■ **Main dimensions**

For a given application (requiring a [certain pull, speed and capacity) there may be several alternatives to choose from.



to hold a net without floats or ballast



Drums with space reserved for the sweeps and bridles

The bare drum diameter B generally does not vary much for a given pull.

Pull (tonnes)	B average (mm)
<3	240
5-8	300
8-13	450
20-30	600

Thus, A and C will be chosen depending on the type of net, use of the drum (storage and/or hauling) the volume of the net, and deck space available.

■ **Pulling force**

In order to maintain the speed of hauling, the pull of the net drum at bare drum should be at least equal to the pull of the winch at full drum.

■ **Hauling speed** is generally great er than or equal to 30 m/min.

A few guidelines:

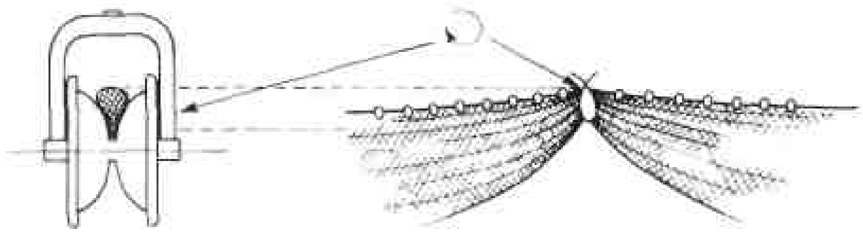
Note that for a given capacity, the pulling force and speed may vary a great deal, according to the strain on the winch.

Vessel horsepower	Capacity (cubic m)	Weight of net (kg)	Pull (t) (bare drum)	Speed (m/min)	Weight of Drum (t)
100	0.5	120			
200	1	250			
300	1.5	400			1-1.2
400	2	550	2-4	10	1.5
500	2.5	700			
600	3	800	6-10	13.5	1.7-1.8
700	3.5	1000			
800	4	1100	7-12	17	2-2.5

** Brake horsepower (BHP) or Apparent Nominal Power (ANP), see page 95*
Power in (HP) = 1.36 x Power in (kW)

Power block

■ **Choice of model**



The netting should fill only the groove (throat) of the power block. The model is chosen according to the circumference of the seine gathered together, estimated by two different methods :

(1) Direct measurement — take the leadline with the floatline to form a large bundle with the netting and measure the circumference of the bundle with a piece of twine, passing it between the leads and the floats.

(2) Calculation

$$\text{Circumference (mm)} = \frac{450}{(0.00006 \times Rtex + 0.02)\sqrt{N}}$$

where Rtex = size of twine in the body of the net

N = number of meshes deep in the purse seine

■ **Pull available**

The power block should be capable of pulling 20% to 50% of the total weight of the net (in air), at speeds of between 30 m/min for a small seiner to 80 m/min for a larger seiner.

Values of pulling force available at mid-diameter for power blocks of different capacities in common use.

Capacity (circumference of net, mm)	Pull tonnes
500-800	0.5-1.5
800-1100	1.0-2.0
1100-1800	3.0-5.0
1800-2500	6.0-8.0

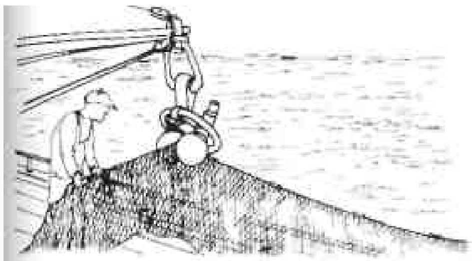
■ **Performance of power blocks in common use according to the size of the vessel**

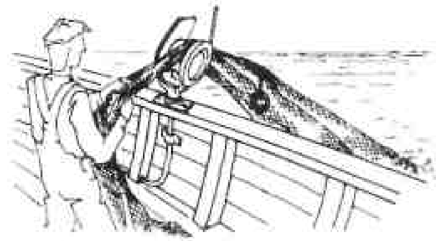
Seiner length (m)	Pull (tonnes) ..	Speed (m/min)	Power (HP*)
9-12	0.5-1.0	30-40	8-16
12-24	1.0-1.5	30-40	13-20
18-30	2	40-50	30-45
24-39	4	40-50	60-85
24-34	5	40-70	80-150
30-75	6-7	40-90	90-220

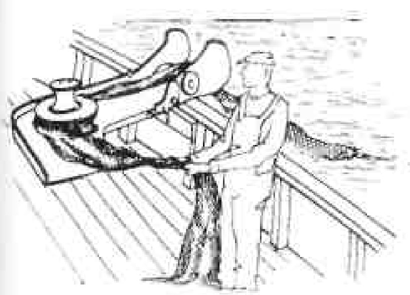
** Power in (HP) = 1.36 x power in (kW)*

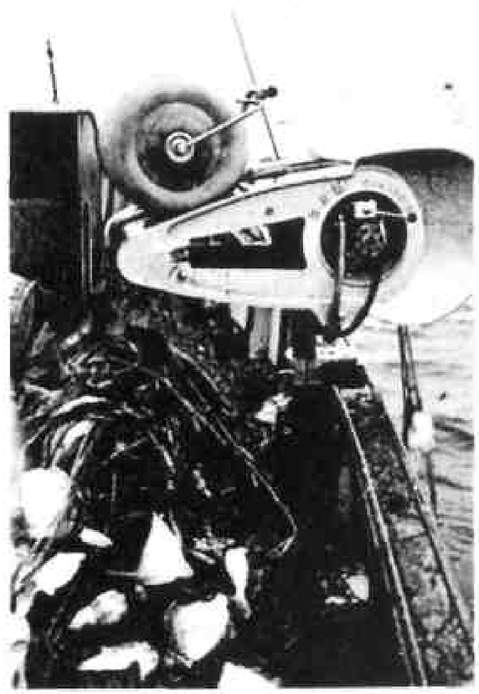
Net haulers: some examples

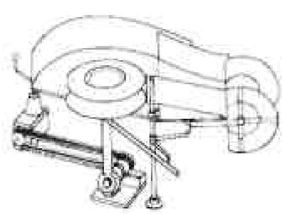
Other than power blocks (page 130)

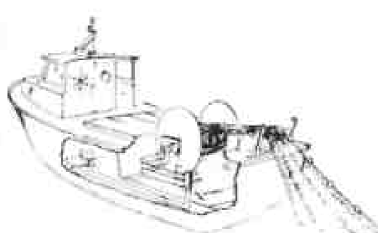




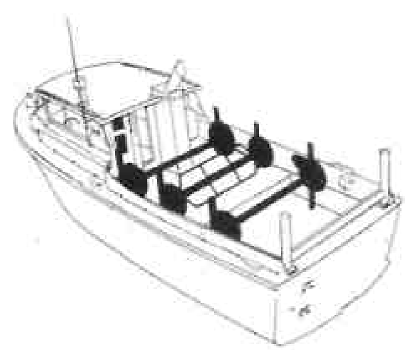








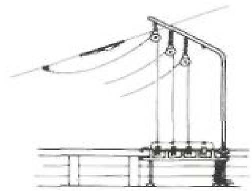
Hauling with a net drum

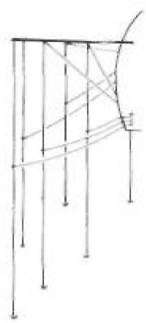


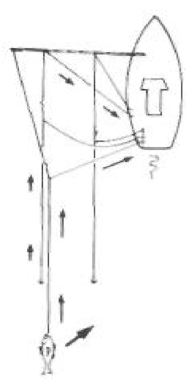
Hauling with a net drum crossing two 'shakers'

Line haulers

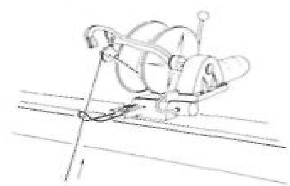
■ **Hauler (gurdy) for trolling lines**

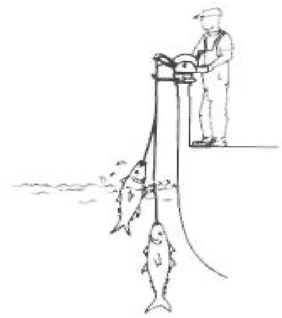


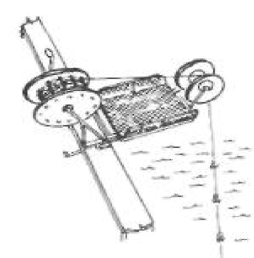




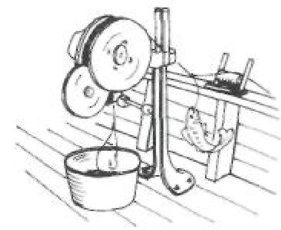
■ **Haulers for vertical lines, jigging machine**

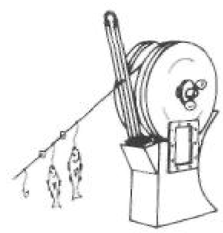


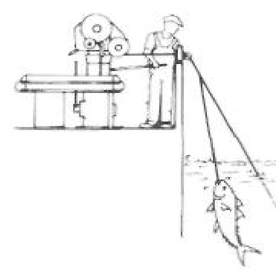




■ **Haulers for long-lines**

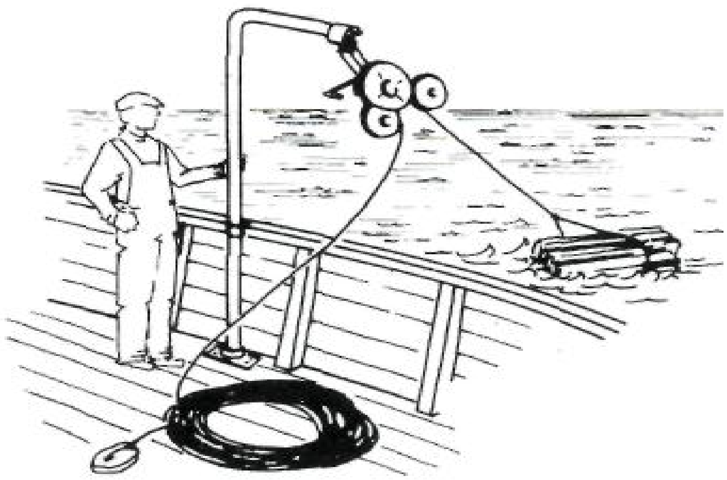


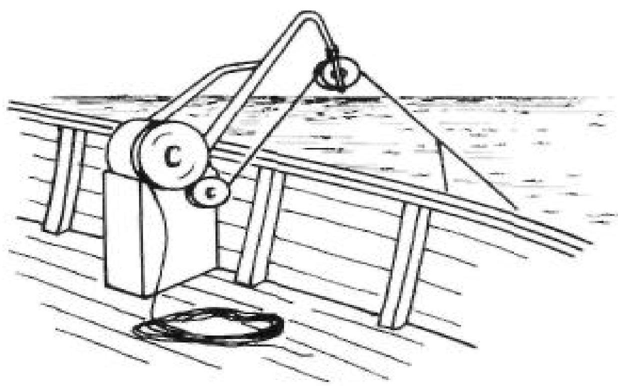




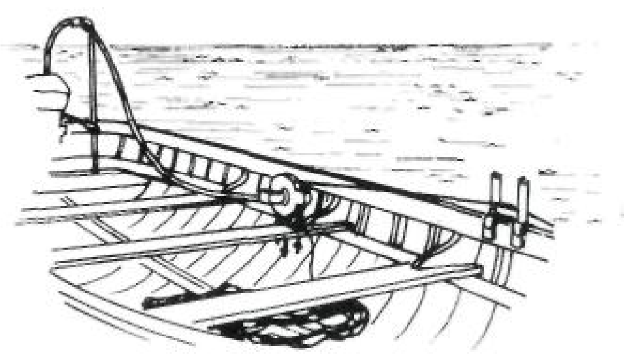
pot/trap haulers

■ **Hydraulic pot hauler**





■ **Pot hauler powered by outboard motor**



Haulers for nets, lines and traps: performance of common types

Note : *within the power limits of the engine (constant torque) :*

At the hauler:	*as speed V increases,*		*pulling force F decreases (the inverse is also true*		*F x V = constant = power of hauler*
	as drum diameter decreases,		*Pulling force F increases (the inverse is also true)*		*F x Ø = constant*

Longline haulers

For longlines up to about 30 km long, with relatively short branchlines (5 m or less), the following pertain to a few types in common use.

Vessel Length (m)	Ø Line (mm)	Pull (kg)	Speed of Hauling (m/min)
<10	<6	200-300	20-40
10-15	6-12	300-400	60
15-20	8-16	500-700	70

For drifting midwater longlines (i.e. Japanese-type longlines for tuna), length is of the order of 100 km, with snoods spaced 50 m or more apart.

Vessel Tonnage	Speed of hauling (m/min)
10	70-80
20	70-90
40	150-210
100 ≥	180-260

■ **Net haulers** : the following pertain to a few types in common use.

Vessel Length (m)	Depth of Water (m)	Pull (kg)	Speed of Hauling (m/min)
5-10	< 100	150-300	20-35
10-15	<200	200-500	25-45
15-20	300 ≥	500-900	50-70

■ **Pot/trap haulers**

Performance is very variable depending on the model, and comparable to that of line haulers and net haulers, except for the existence of models with pulling force greater than 1000 kg (1000, 1350, 1500 kg) and higher hauling speeds.