



**Relationship on the Characteristics of Trawl Net, Otter board, and  
Trawler of Thailand**

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# Relationship on the Characteristics of Trawl Net, Otter board, and Trawler of Thailand

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## Abstract

The study on the Relationship of the Characteristics of Trawl Net, Otter Board, and Trawler of Thailand is carried out by using the data of trawl net, accessories and trawlers from the trawl fishing gear and trawler survey along the coast of the Gulf of Thailand, in the year 2015. Forty-six (46) bottom trawl nets of thirty-seven (37) otter board trawlers were surveyed and collected technical data, *i.e.* length overall (m), trawler size (gross tonnage: GT), engine power (kW), otter board area (m<sup>2</sup>), otter board height (cm) and head rope length (m).

Result of the study reveals that trawler size, engine power, the height of otter board, area of otter board, head rope, and ground rope, shows the correlation among them, between 0.73 - 0.99 at confident level 95% The very high correlation, 0.986, is found in the comparison between the height of otter board and length of otter board. The lowest correlation, 0.727, was found in the comparison between gross tonnage and head rope. The study on the influence of independent variable *i.e.* length overall (m), trawler size (GT), engine power (kW), otter board area (m<sup>2</sup>), otter board height (m), and head rope length (m) to dependent variable shown by R-square value at confidence level 95% Range of R-square value between 21% - 91%. The highest R-square value, 90.94 was found in the comparison between the area of otter board and length of otter board. The lowest R-square value, 21.88 was found in the comparison between engine power and head rope length.

Fisheries manager can apply the study result to control the efficiency of the trawl net. Management measures on trawl gears and trawlers can apply through fishing gear inspection on the trawl parts which can be selected from the study result, such as the area of otter board, engine power, ground rope, etc. According to that trawl net and trawler collected in this survey was less in number compared with the total trawl net of Thailand, further data collection should be continue undertaken to generate a more accurate result to serve better management.

**Keywords:** characteristic, trawl net, otter board, trawl

## Material and Method

The research method, Rural Rapid Appraisal (RRA) by reviewing secondary data, is applied as a research method of the study. Data used for the investigation of a relationship on the characteristics of trawl net, otter board, and trawler is referred to as the Report on the Survey of Trawl Net of Thailand (in Thai) (TD/RP/193) published by SEAFDEC Training Department (SEAFDEC/TD) in September 2017. Supplementary references are the Fishing Gear and Method of Southeast Asia: I (Thailand) 1<sup>st</sup> and 2<sup>nd</sup> edition published by SEAFDEC/TD in the years 1986 and 2004.

Pearson's correlation coefficient and Regression Analysis is applied to investigate the relationship on the characteristics of trawl net, otter board, and trawler of Thailand.

## Result

### 1. Definition of Trawl

The Food and Agriculture Organization of the United Nations (FAO) defines trawl as a cone-shaped net (made from two, four, or more panels) which are towed, by one or two boats, on the bottom or in midwater (pelagic). The cone-shaped body ends in a bag or coded. The horizontal opening of the gear, while it is towed, is maintained by beams, otter boards, or by the distance between the two (2) towing vessels (pair trawling). Floats and weights and/or hydrodynamic devices provide for the vertical opening. Two parallel trawls might be rigged between two otter boards (twin trawls). (<http://www.fao.org/fishery/geartype/> access on 1 January 2020). In addition, Bundit (1985) refers to Baranov (1977) defines trawl net is towing distance is more than five (5) times of net length. This report emphasizes on the relationship of characteristics of single trawl net with otter board (called trawl door) and trawler of Thailand.

### 2. General information on the otter board trawl net and trawler

Refer to the Preliminary Report on the Survey of Trawl Net of Thailand (in Thai) (TD/RP/193), there were 46 trawl net models from 37 trawlers being collected. Trawlers can be classified into four (4) main categories according to the categories of a fishing vessel of Thailand.

The overall result of the survey on the otter board trawl net and trawler has found that the range of float rope was between 9.0-49.5 m. The range of ground rope length was found 10.0-54.0 m. The range of net body length without cod-end was found 11.5 – 120.0 m. The range of trawler length overall was found between 9.0-141.0 m. The range of engine size was found between 47-373 kilowatts (64-500 hp). The range of otter board area was found between 1.0-3.6 m. The range of otter board height was found between 0.6 - 1.2 m. (**Table 1**)

**Table 1:** Partial characteristic of otter board trawl net, trawler, and its accessories.

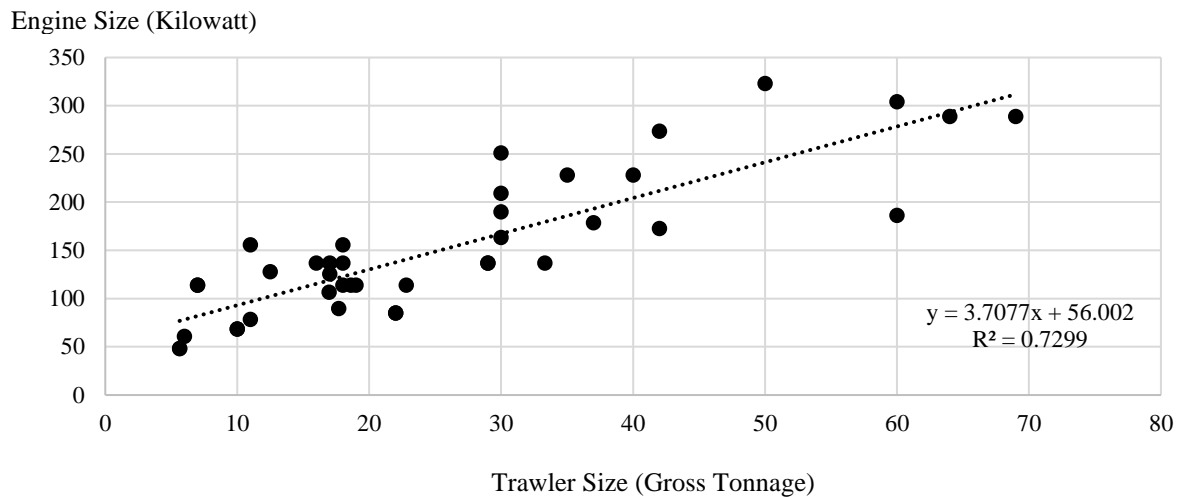
Feature	Size of trawler (gross ton)				
	Total	<10	10 > 20	20 > 60	60 > 150
Number of Trawler	37	3	13	15	4
Number of Trawl net	46	5	15	18	8
Length Overall (m.)	9 – 25	9 - 11	11 - 16	14 - 24	18 - 25
Size (Gross ton)	6 – 141	6 - 7	10 - 19	22 - 50	60 - 141
Engine (Kilowatt)	47 – 373	47 - 112	67 - 153	84 - 317	183 - 373
Otter board height (m)	0.6 - 1.2	0.6 - 0.7	0.7 - 0.8	0.8 - 1.2	1.0 - 1.2
Otter board size (m <sup>2</sup> )	1.0 - 3.6	1.0 - 1.4	1.0 - 1.7	1.5 - 3.6	2.3 - 3.6
Head rope length (m)	9.0 - 49.5	9.0 - 31.4	17.0 - 31.0	16.0 - 49.5	28.4 - 40.0
ground rope length (m)	10.0 - 54.0	10.0 - 37.4	20 - 38.4	24.0 - 54.0	32.4 - 46.0
overall trawl net length (m)	11.5 - 120.0	11.5 - 49.5	16.0 - 48.0	25.6 - 50.6	35.5 - 120.0

### 3. Relationship on the Characteristics of otter trawl net trawler and their accessories

#### 3.1. Relationship between trawler size and other characteristics of trawler and otter board trawl net

##### 3.1.1. Relationship between trawler size and engine power

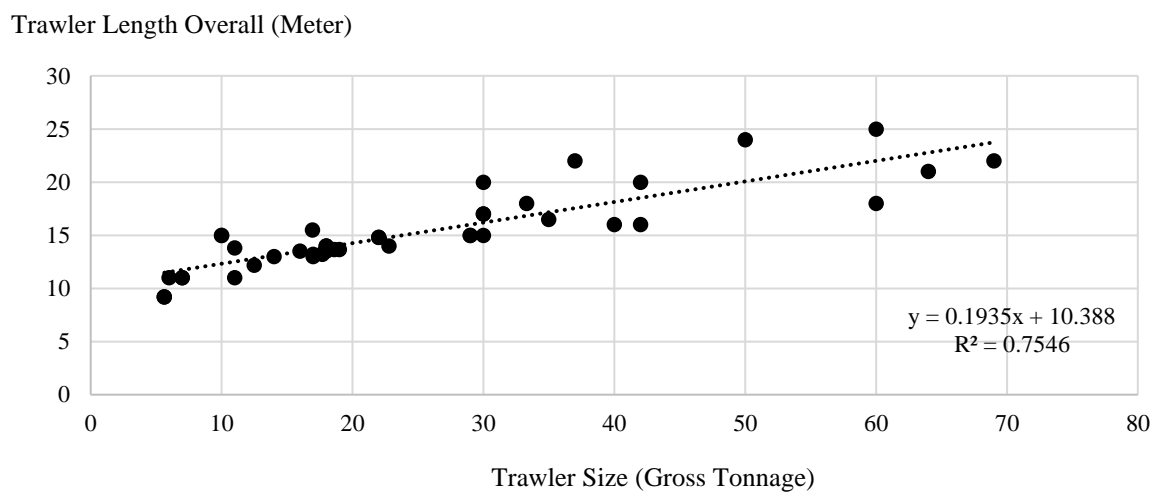
The relationship between trawler size (gross tonnage: GT) and engine size (kilowatt: kW) was calculated by Pearson's correlation coefficient results in 0.88 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and engine size (kW) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.73, at confidential 95%. Calculation on the equation of the relationship between trawler size (GT) and engine size (kW) showing;  $y = 0.1935x + 10.388$ , while X-axis is trawler size (GT) and the Y-axis is engine size (kW). (See **Figure 1**)



**Figure 1:** Relationship between trawler size (gross tonnage) and engine size (kilowatt)

##### 3.1.2. Relationship between trawler size and trawler length overall

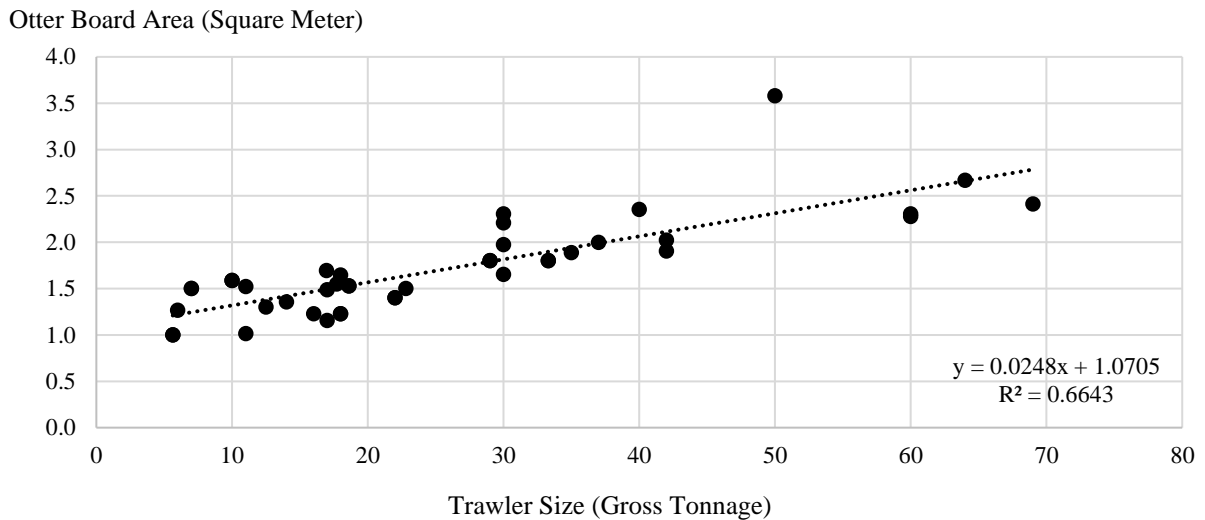
The relationship between trawler size (gross tonnage: GT) and trawler length overall (meters: m.) was calculated by Pearson's correlation coefficient results in 0.88 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and trawler length overall (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.76 at confidential 95%. Calculation on the equation of the relationship between trawler size (GT) and trawler length overall (m.) showing  $y = 0.1935x + 10.388$  while X-axis is trawler size (GT) and the Y-axis is trawler length overall (m.). (See **Figure 2**)



**Figure 2:** Relationship between trawler size (gross tonnage) and trawler length overall (meters)

### 3.1.3. Relationship between trawler size and otter board area

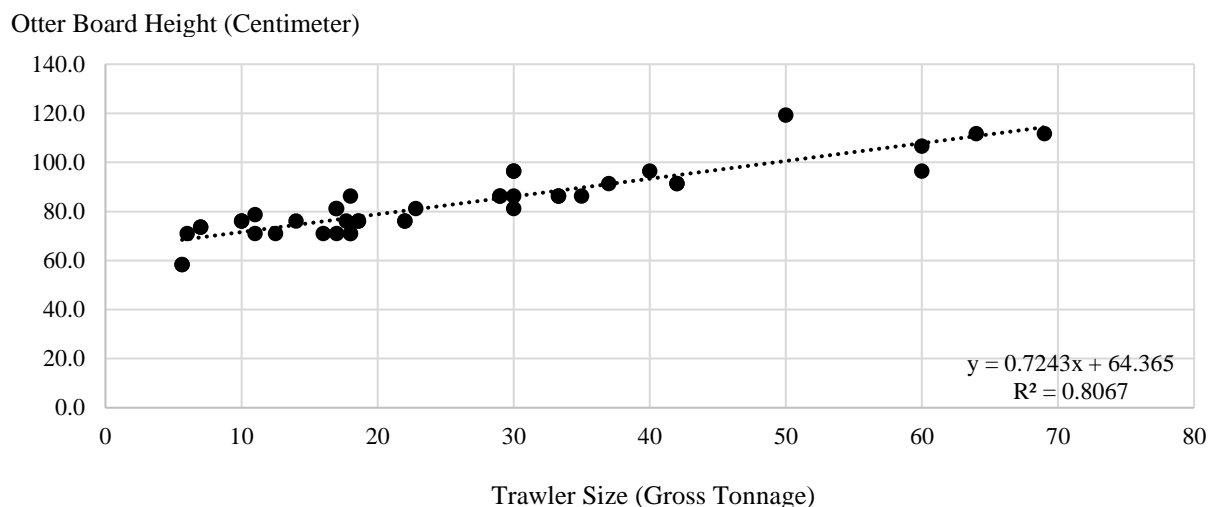
The relationship between trawler size (gross tonnage: GT) and otter board area (square meter: m<sup>2</sup>) was calculated by Pearson's correlation coefficient results in 0.84 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and otter board area (m<sup>2</sup>) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.66, at confidential 95%. Calculation on the equation of the relationship between trawler size (GT) and otter board area (m<sup>2</sup>) showing;  $y = 0.0248x + 1.0705$  while X-axis is trawler size (GT) and the Y-axis is otter board area (m<sup>2</sup>). (See **Figure 3**)



**Figure 3:** Relationship between trawler size (gross tonnage) and otter board area (square meter)

### 3.1.4. Relationship between Trawler Size and otter board height

The relationship between trawler size (gross tonnage: GT) and otter board height (centimeter: cm.) was calculated by Pearson's correlation coefficient results in 0.83 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and otter board height (cm.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.81, at confidential level 95%. Calculation on the equation of the relationship between trawler size (GT) and otter board height (cm.) showing;  $y = 0.7243x + 64.365$  while X-axis is trawler size (GT) and the Y-axis is otter board height (cm.). (See **Figure 4**)

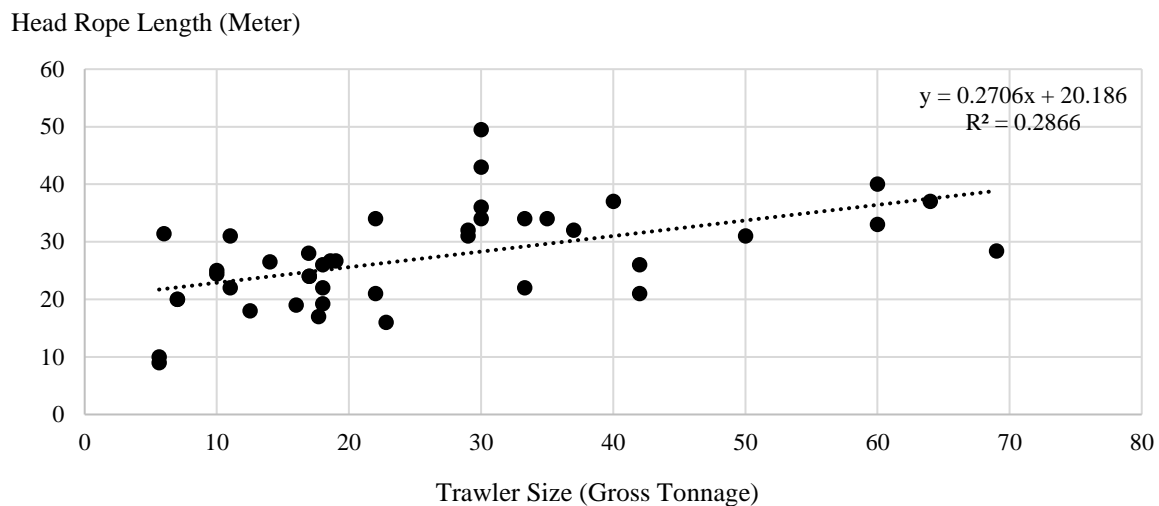


**Figure 4:** Relationship between trawler size (gross tonnage) and otter board height (meter)



### 3.1.5. Relationship between Trawler Size and Head Rope Length

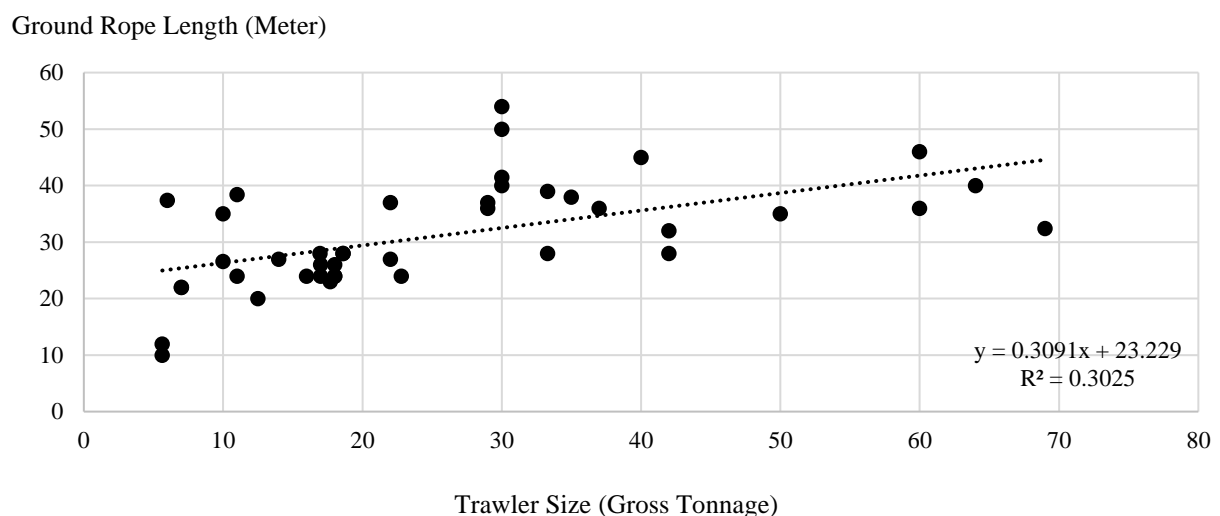
The relationship between trawler size (gross tonnage: GT) and head rope length (meter: m.) was calculated by Pearson's correlation coefficient results in 0.73 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and head rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.29, at confidential level 95%. Calculation on the equation of the relationship between trawler size (GT) and head rope length (m.) showing  $y = 0.2706x + 20.186$  while X-axis is trawler size (GT) and the Y-axis is head rope length (m.) (See **Figure 5**)



**Figure 5:** Relationship between trawler size (gross tonnage) and head rope length (meter)

### 3.1.6. Relationship between Trawler Size and Ground Rope Length

The relationship between trawler size (gross tonnage: GT) and ground rope length (meter: m) was calculated by Pearson's correlation coefficient results in 0.73 at the confident 95%. The study on the influence of variable between trawler size (GT) as an independent variable and head rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.30, at confidential level 95%. Calculation on the equation of the relationship between trawler size (GT) and head rope length (m.) showing;  $y = 0.3091x + 23.229$  while X-axis is trawler size (GT) and the Y-axis is head rope length (meter). (See **Figure 6**)

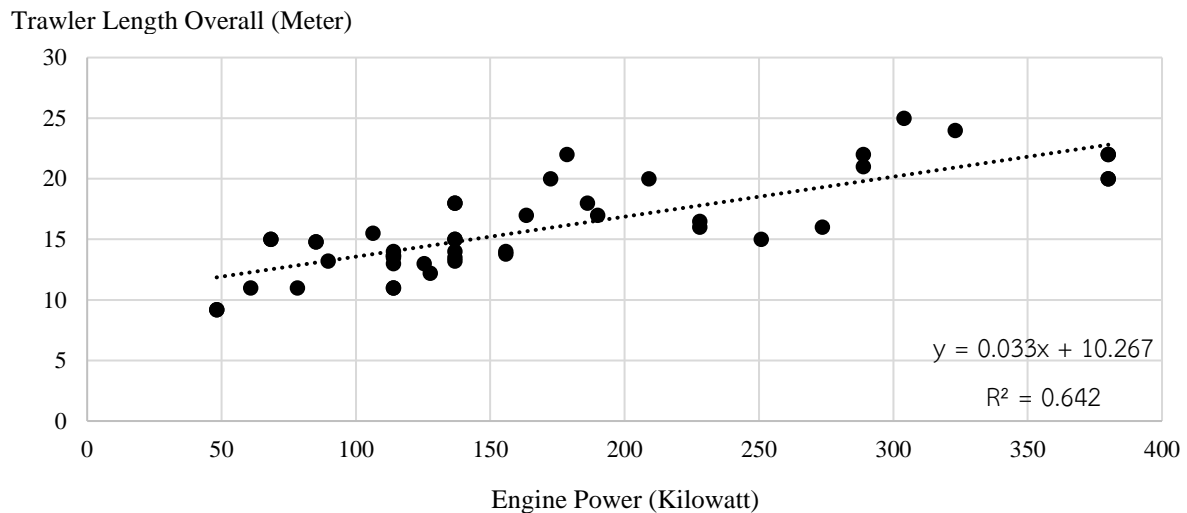


**Figure 6:** Relationship between trawler size (gross tonnage) and ground rope length (meter)

### 3.2. Relationship between Engine Power and other characteristic of trawler and otter board trawl net

#### 3.2.1. Relationship between Engine Power and Trawler Length Overall

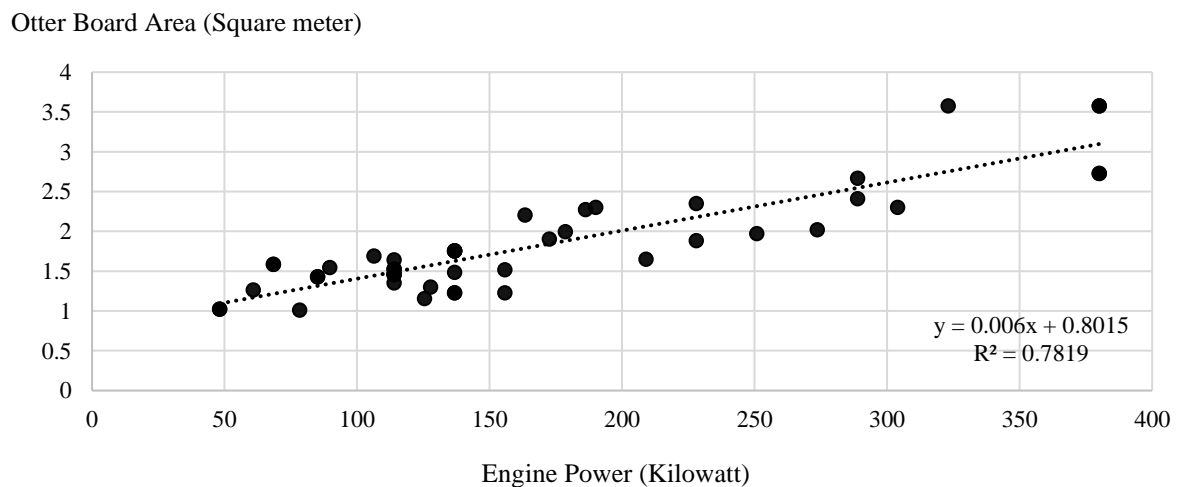
The relationship between engine power (kilowatt: kW) and trawler length overall (meter: m.) was calculated by Pearson's correlation coefficient results in 0.87 at the confident 95%. The study on the influence of variable between engine power (kW) as an independent variable and trawler length overall (m) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.64 at confidential 95%. Calculation on the equation of the relationship between engine power (kW) and trawler length overall (m.) showing  $y = 0.033x + 10.267$  while X-axis is engine power (kW) and the Y-axis is trawler length overall (m.). (See **Figure 7**)



**Figure 7:** Relationship between trawler size (gross tonnage) and ground rope length (meter)

#### 3.2.2. Relationship between Engine Power and Otter Board Area

The Relationship between engine power (kilowatt: kW) and otter board area (square meters: m<sup>2</sup>) was calculated by Pearson's correlation coefficient results in 0.94 at the confident 95%. The study on the influence of variable between engine power (kW) as an independent variable and otter board area (m<sup>2</sup>) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.78 at confidential 95%. Calculation on the equation of the relationship between engine power (kW) and otter board area (square meters) showing  $y = 0.006x + 0.8015$  while X-axis is Engine Power (kW) and the Y-axis is Otter Board Area (m<sup>2</sup>). (See **Figure 8**)

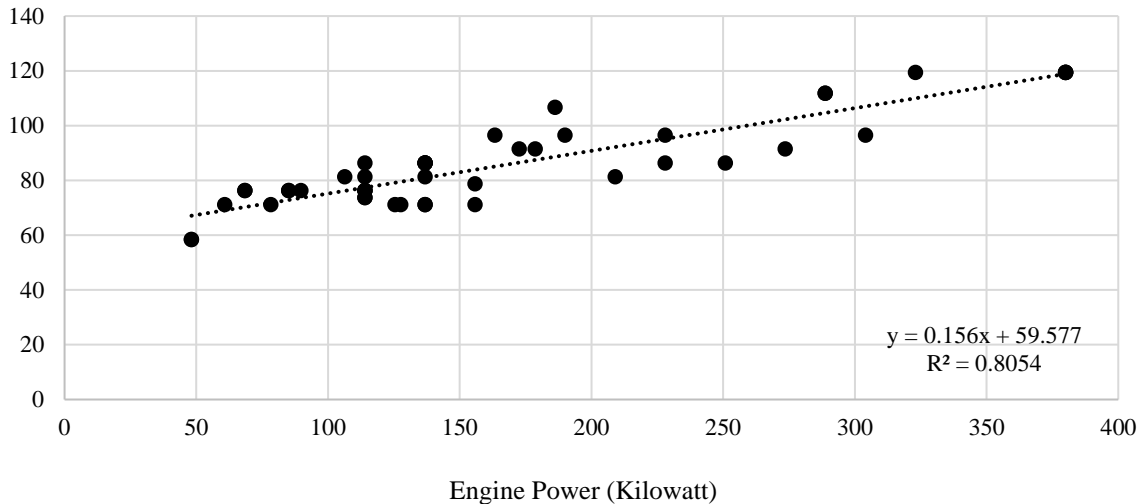


**Figure 8:** Relationship between engine power (kilowatt) and otter board area (square meter)

### 3.2.3. Relationship between Engine Power and Otter Board Height

The relationship between engine power (kilowatt: kW) and otter board height (centimeter: cm.) was calculated by Pearson's correlation coefficient results in 0.89 at the confident 95%. The study on the influence of variable between engine power (kW) as an independent variable, and otter board height (cm.) as a dependent variable is calculated by Regression Analysis. Result found that the R-square value = 0.80 at confidential 95%. Calculation on the equation of the relationship between engine power (kW) and otter board height (cm.) showing  $y = 0.156x + 59.577$  while X-axis is engine power (kW) and the Y-axis is otter board height (cm.). (See **Figure 9**)

Otter Board Height (Centimeter)

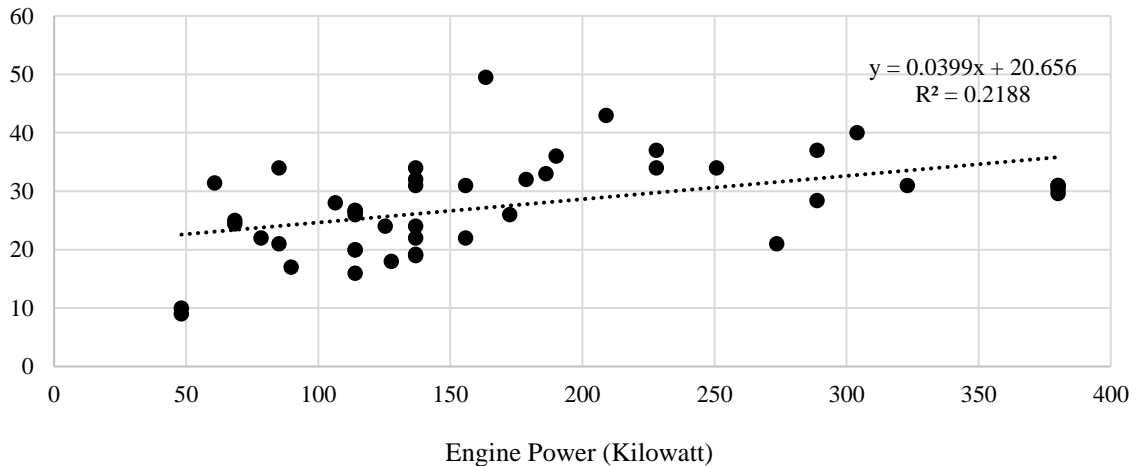


**Figure 9:** Relationship between engine power (kilowatt) and otter board height (centimeters)

### 3.2.4. Relationship between Engine Power and Head Rope Length

The relationship between engine power (kilowatt: kW) and head rope length (meter: m.) was calculated by Pearson's correlation coefficient results in 0.76 at the confident 95%. The study on the influence of variable between engine power (kW) as an independent variable, and head rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.22, at confidential level 95%. Calculation on the equation of relationship between engine power (kW) and head rope length (m.) showing;  $y = 0.0399x + 20.656$  while X-axis is engine power (kW) and the Y-axis is head rope length (m.). (See **Figure 10**)

Head Rope Length (Meter)

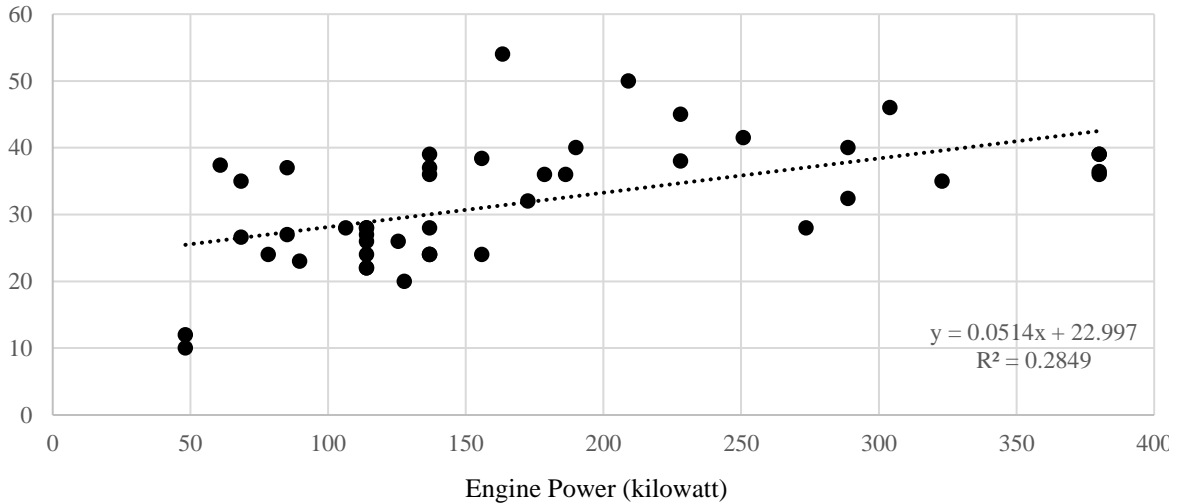


**Figure 10:** Relationship between engine power (kilowatt) and head rope length (meter)

### 3.2.5. Relationship between Engine Power (Kilowatt) and Ground Rope Length (Meter)

The relationship between engine power (Kilowatt: kW) and ground rope length (Meter: m.) was calculated by Pearson's correlation coefficient results in 0.78 at the confident 95%. The study on the influence of variable between engine power (kW) as an independent variable and ground rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.28, at confidential level 95%. Calculation on the equation of relationship between engine power (kW) and ground rope length (m.) showing;  $y = 0.0514x + 22.997$  while X-axis is engine power (kW) and the Y-axis is ground rope length (m.). (See **Figure 11**)

Ground Rope Length (Meter)



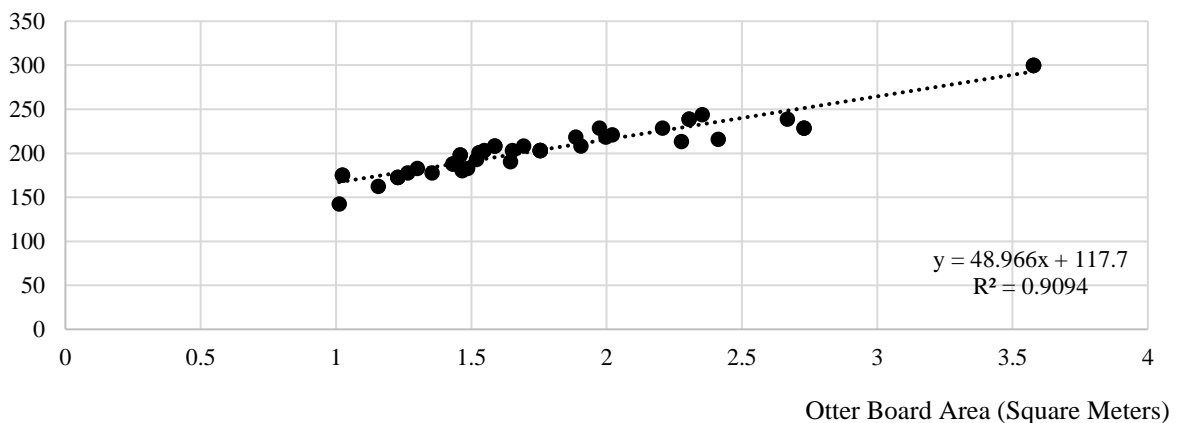
**Figure 11:** Relationship between engine power (kilowatt) and ground rope length (meter)

### 3.3. Relationship between Otter Board Area and Other Characteristic of Trawler and Otter Board Trawl Net

#### 3.3.1. Relationship between Otter Board Area and Otter Board Length

The relationship between otter board area (square meter:  $m^2$ ) and otter board length (centimeter: cm.) was calculated by Pearson's correlation coefficient results in 0.96 at the confident 95%. The study on the influence of variable between otter board area ( $m^2$ ) as an independent variable and otter board length (cm.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.91 at confidential 95%. Calculation on the equation of the relationship between otter board area ( $m^2$ ) and otter board length (cm.) showing  $y = 48.966x + 117.7$  while X-axis is otter board area ( $m^2$ ) and the Y-axis is otter board length (cm.). (See **Figure 12**)

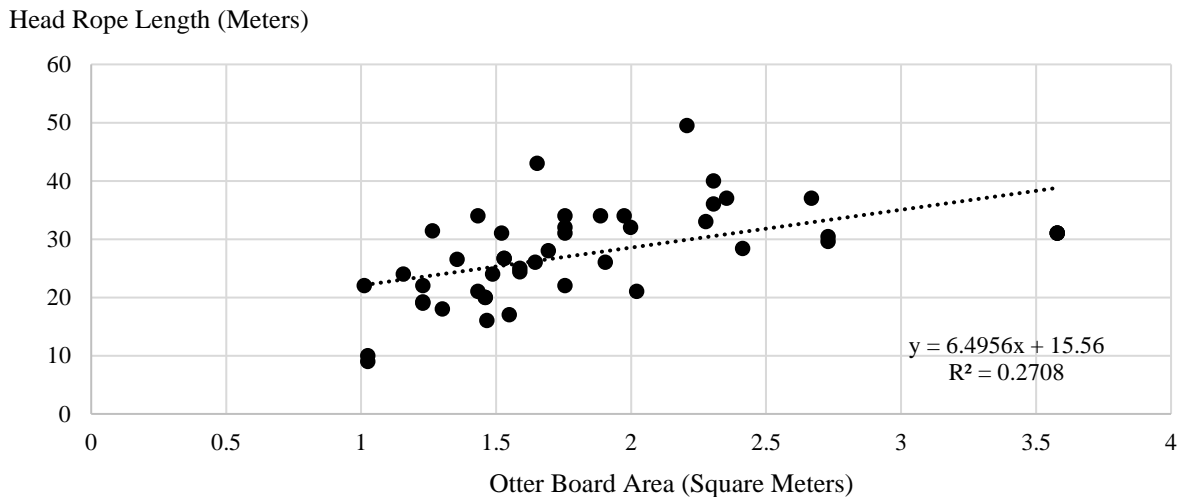
Otter Board Length (Centimeter)



**Figure 12:** Relationship between otter board area (square meters) and otter board length (meter)

### 3.3.2. Relationship between Otter Board Area and Head Rope Length

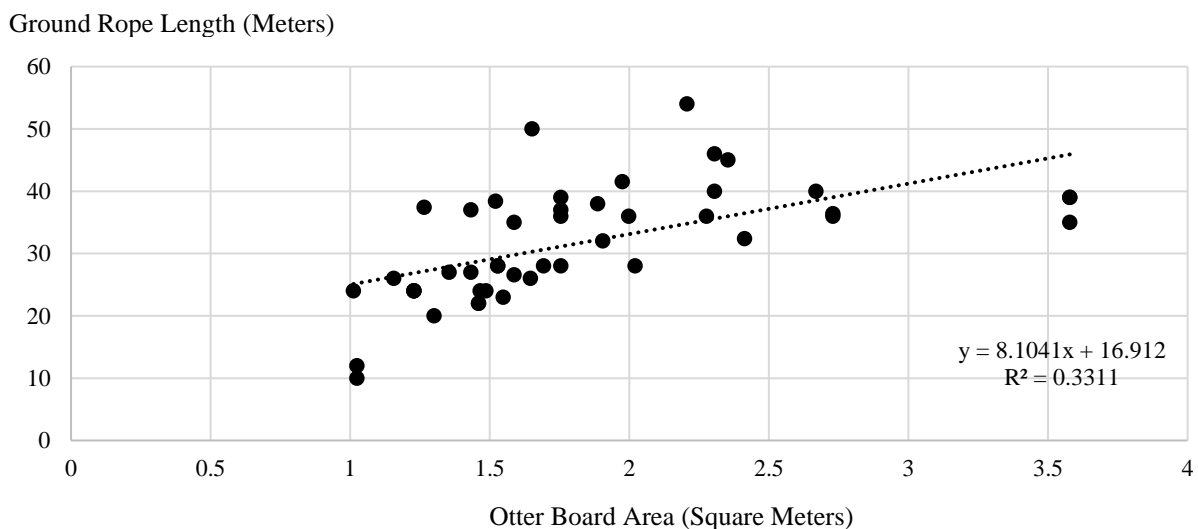
The relationship between otter board area (Square Meters:  $m^2$ ) and head rope length (m.) was calculated by Pearson's correlation coefficient results in 0.87 at the confident 95%. The study on the influence of variable between otter board area ( $m^2$ ) as an independent variable and head rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.27 at confidential 95%. Calculation on the equation of the relationship between otter board area ( $m^2$ ) and head rope length (m.) showing  $y = 6.4956x + 15.56$  while X-axis is otter board area ( $m^2$ ) and the Y-axis is head rope length (m.). (See **Figure 13**)



**Figure 13:** Relationship between Otter Board Area (square meters) and Head Rope Length (meter)

### 3.3.3. Relationship between Otter Board Area and Ground Rope Length

The relationship between otter board area (square meters:  $m^2$ ) and ground rope length (meters: m.) was calculated by Pearson's correlation coefficient results in 0.96 at the confident 95%. The study on the influence of variable between otter board area ( $m^2$ ) as an independent variable and ground rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.33 at confidential 95%. Calculation on the equation of the relationship between otter board area ( $m^2$ ) and ground rope length (m.) showing  $y = 8.1041x + 16.912$  while X-axis is otter board area ( $m^2$ ) and the Y-axis is ground rope length (m.). (See **Figure 14**)

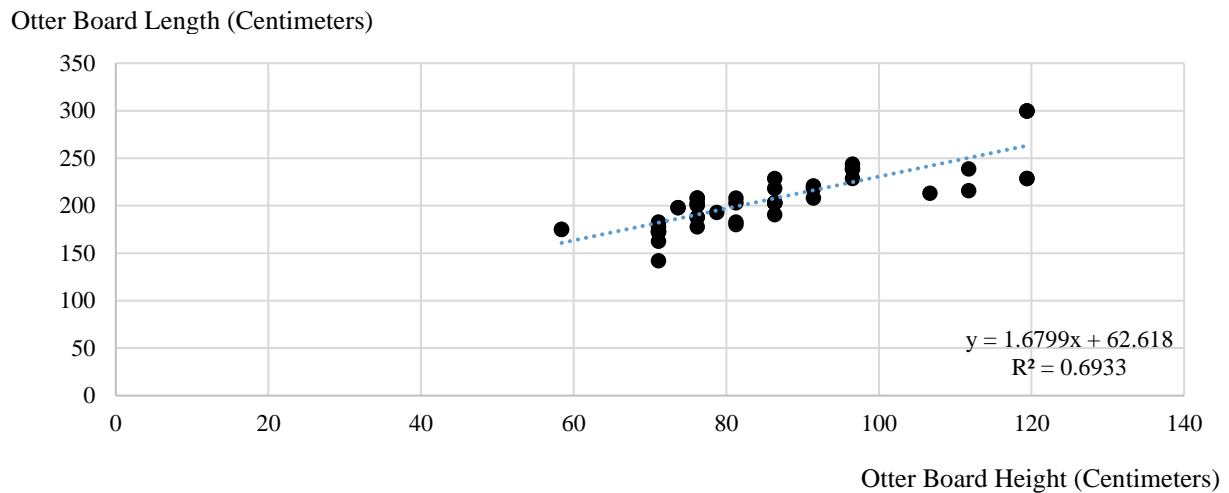


**Figure 14:** Relationship between otter board area (square meters) and ground rope length (meters)

### 3.4. Relationship between Otter Board Height and Other Characteristic Trawl Net

#### 3.4.1. Relationship between otter board height and otter board length

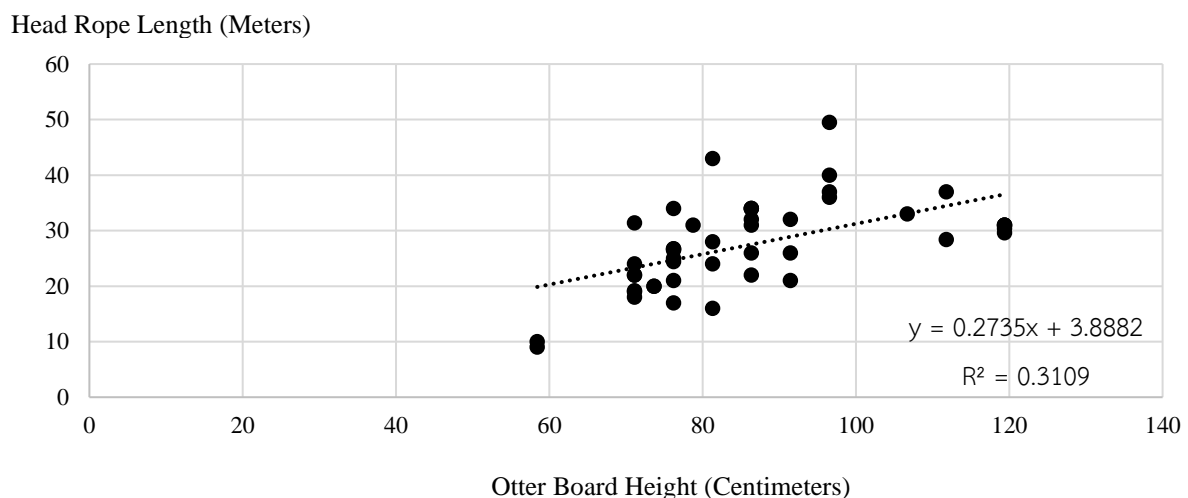
The relationship between otter board height (centimeters: cm.) and otter board length (centimeter: cm.) was calculated by Pearson's correlation coefficient results in 0.99 at the confident 95%. The study on the influence of variable between otter board height (cm.) as an independent variable and otter board length (cm.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.69 at confidential 95%. Calculation on the equation of the relationship between otter board height (centimeters) and otter board length (cm.) showing  $y = 1.6799x + 62.618$  while X- axis is Otter Board Height (cm.), and the Y-axis is Otter Board Length (cm.). (See **Figure 15**)



**Figure 15:** Relationship between otter board height (centimeters) and otter board length (centimeters)

#### 3.4.2. Relationship between otter board height and head rope length

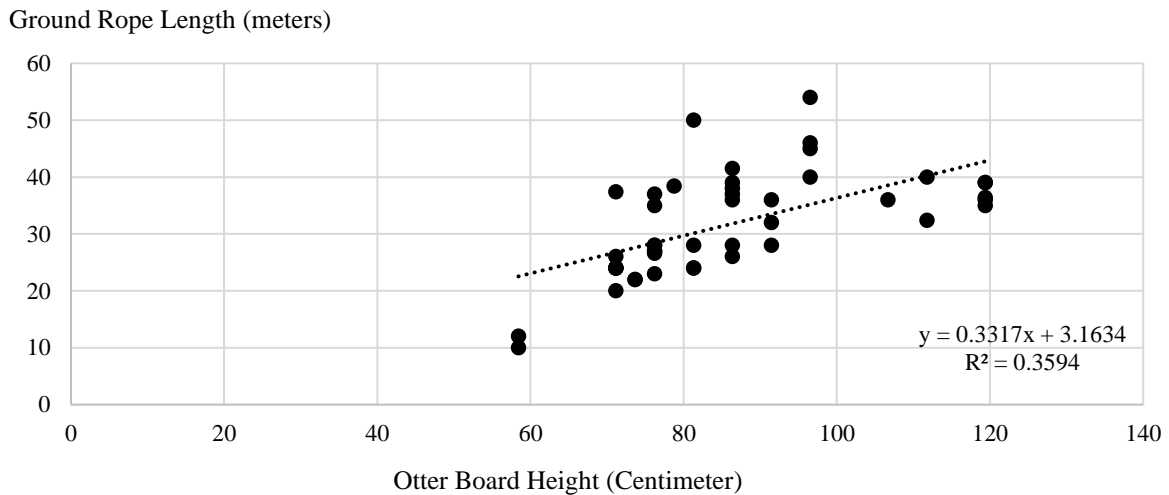
The relationship between otter board height (centimeters: cm.) and head rope length (meters: m.) was calculated by Pearson's correlation coefficient results in 0.93 at the confident 95%. The study on the influence of variable between otter board height (cm.) as an independent variable and head rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.31 at confidential 95%. Calculation on the equation of the relationship between otter board height (cm.) and head rope length (m.) showing  $y = 0.2735x + 3.8882$  while X- axis is otter board height (cm.), and the Y-axis is head rope length (m.). (See **Figure 16**)



**Figure 16:** Relationship between otter board height (centimeters) and head rope length (meters)

### 3.4.3. Relationship between otter board height and ground rope length

The relationship between otter board height (centimeters: cm.) and ground rope length (meters: m.) was calculated by Pearson's correlation coefficient results 0.94 at the confident 95%. The study on the influence of variable between otter board height (cm.) as independent variable and ground rope length (m.) as dependent variable is calculated by Regression Analysis. The result found that the R-square value = 0.36 at confidential 95%. Calculation on the equation of the relationship between otter board height (cm.) and ground rope length (m.) showing  $y = 0.3317x + 3.1634$  while X-axis is otter board height (cm.), and the Y-axis is ground rope length (m.). (See **Figure 17**)

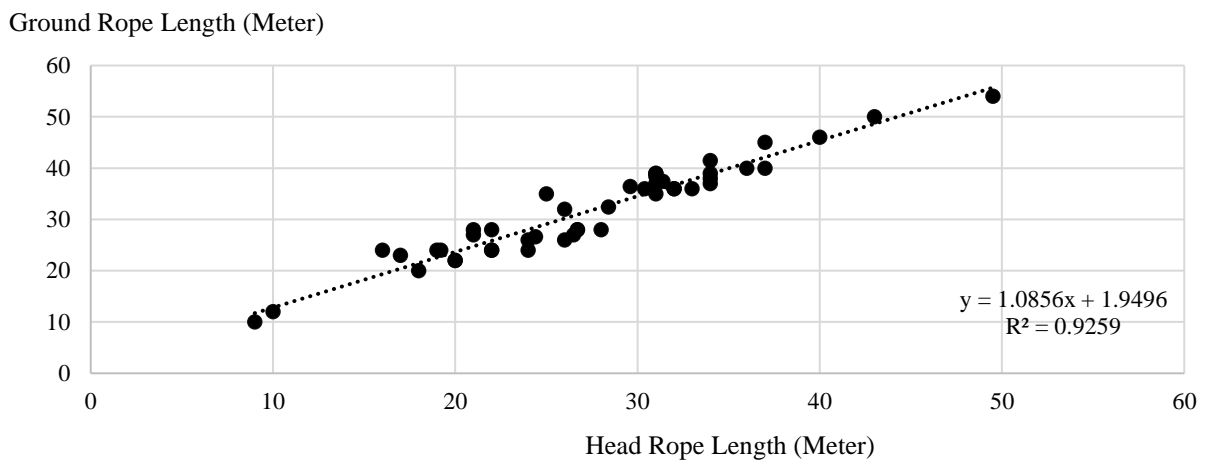


**Figure 17:** Relationship between otter board height (centimeters) and ground rope length (meters)

### 3.5. Relationship between Head Rope Length and Ground Rope Length

#### 3.5.1. Relationship between Head Rope Length (meters) and Ground Rope Length (meters)

The relationship between head rope length (meter: m) and ground rope length (meter: m) was calculated by Pearson's correlation coefficient results in 0.99 at the confident 95%. The study on the influence of variable between head rope length (m.) as an independent variable and ground rope length (m.) as a dependent variable is calculated by Regression Analysis. The result found that the R-square value is 0.92 at confidential 95%. Calculation on the equation of the relationship between head rope length (m) and ground rope length (m) shows  $y = 1.0856x + 1.9496$  while X-axis is otter board height (m.) and the Y-axis is otter board length (m.). (See **Figure 18**)



**Figure 18:** Relationship between Head rope length (meters) and Ground rope length (meters)

## Summary

1. The Correlation coefficient between the size of a trawler with trawler length, engine power, area of otter board, the height of otter board, head rope, and ground rope, is high level.
2. The Correlation coefficient between engine power with trawler length, area of otter board, the height of otter board, head rope, and ground rope, is high level. The Correlation coefficient between engine powers with the area of otter board is very high level.
3. The Correlation coefficient between areas of the otter board with head rope is high level. The Correlation coefficient between the area of otter board, and length of otter board and ground rope, is very high level.
4. The Correlation coefficient between the height of the otter board with a length of otter board, head rope, and ground rope, is very high level.
5. The Correlation coefficient between a head rope and ground rope is found at a very high level.

**Table 2:** Summary of the correlation of partial characteristic of otter board trawl net, trawler, and its accessories.

<b>Characteristics of Otter Trawl Net and Their Fishing Boats</b>		<b>Level of correlation</b>
<b>Independent variable</b>	<b>Dependent variable</b>	
Gross Tonnage (GT)	Length Overall (m)	High
	Engine Power (kW)	High
	Area of Otter board (m <sup>2</sup> )	High
	Height of Otter Board (m)	High
	Head Rope (m)	High
	Ground Rope (m)	High
Engine Power (kW)	Length Overall (m)	High
	Area of Otter board (m <sup>2</sup> )	Very High
	Height of Otter Board (cm)	High
	Head Rope (m)	High
	Ground Rope (m)	High
Area of Otter board (m <sup>2</sup> )	Length of Otter Board (cm)	Very High
	Head Rope (m)	Very High
	Ground Rope (m)	Very High
Head Rope (m)	Ground Rope (m)	Very High



## **Recommendations**

1. The result of the relationship of the characteristics of trawl net, otter board, and trawlers can be a reference to standardize otter board, trawl net, and the trawler used in Thailand.
2. This study will not include semi-pelagic trawl net (High opening trawl net design) and bottom pair trawls so that the further collected and study on its characteristics.
3. The result of the relationship of the characteristics of trawl net, otter board, and trawlers is possible as a reference of the standardization of otter board, trawl net, and trawler used in Cambodia, Myanmar, and Viet Nam because the technology of Thai trawler, trawl net, and their accessories was transferred to Cambodia and Myanmar.
4. The knowledge could be used in fisheries patrolling operations. Example case, small trawlers that install small otter boards but use trawler net with long ground rope and head rope. This is possible to operate by pair trawling rather than single otter trawl.
5. Information on the trawler, a size larger than 150 GT and pair trawl should be further collected and study on its relationship.
6. The data of the ground gear of trawl net should be further collected for studying impacts of trawling to the bottom ecosystem as well as improve low impact ground gear in the future.

## **Acknowledgement**

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## Annex

### Annex 1: Trawl net log sheet

Name of Vessel					
Size of Trawler (Gross tonnage)	S	M	L	XL	
Length Overall (m)					
Engine power (kW/HP)					
Reduction gear					
Propeller Size (inch)					
Otter board (OB) Size (cm)					
Type of OB		OBT with boom		OBT without Boom	
Towing warp		Type or rope/wire		Length (m)	
Sweep line		No	Yes	Length (m)	
Net Pendant Upper		Type or rope/wire		Length (m)	
Net Pendant Lower		Type or rope/wire		Length (m)	
Type of net		Shrimp net	Fish net	Hybrid	Target Catch
Head Rope		Type or rope/wire		Length (m)	
Ground Rope		Type or rope/wire		Length (m)	
Ground Gear		Type	Size	Total weight (kg)	
Float		Type	Size	Number	
Total Length (Stretch mesh) of Net body (m)					
Upper Wing		Net material	Mesh size (mm)	Length (m)	
Lower Wing		Net material	Mesh size (mm)	Length (m)	
Height of the end of wing part (m.)					
Triangle net	Net material	Mesh size (mm)	Length (m)		
Square Part	Net material	Mesh size (mm)	Total Length (Stretch mesh) (m)	Net Circumference (m)	
Baiting/Belly	Net material	Mesh size (mm)	Total Length (Stretch mesh) (m)	Net Circumference (m)	
Cod-end part	Net material	Mesh size (mm)	Total Length (Stretch mesh) (m)	Net Circumference (m)	

**Annex 2:** Data to calculate the relationship on the characteristics of trawl net, otter board, and trawler

Trawler Size (GT)	LOA (m)	Engine Power (kW)	Dimension of OB		Ratio between Length and Height of OB	Area of OB (m <sup>2</sup> )	Length (m) of		Ratio between Ground rope and Head rope	Overall Net Length (m)
			Height (m)	Length (m)			Head rope	Ground rope		
6	11	60	0.7	1.8	2.50	1.3	31.4	37.4	1.19	41.9
6	9	47	0.6	1.8	3.00	1.0	9.0	10.0	1.11	11.5
6	9	47	0.6	1.8	3.00	1.0	10.0	12.0	1.20	16.3
7	11	112	0.7	2.0	2.79	1.4	20.0	22.0	1.10	27.3
7	11	112	0.7	2.0	2.79	1.4	20.0	22.0	1.10	24.5
10	15	67	0.8	2.1	2.73	1.6	24.4	26.6	1.09	45.8
10	15	67	0.8	2.1	2.73	1.6	25.0	35.0	1.40	34.5
11	14	153	0.8	1.9	2.45	1.5	31.0	38.4	1.24	39.5
11	11	77	0.7	1.4	2.00	1.0	22.0	24.0	1.09	23.3
13	12	125	0.7	1.8	2.57	1.3	18.0	20.0	1.11	31.3
14	13	112	0.8	1.8	2.33	1.4	26.5	27.0	1.02	28.2
16	14	134	0.7	1.7	2.43	1.2	19.0	24.0	1.26	31.7
17	13	123	0.7	1.6	2.29	1.2	24.0	26.0	1.08	24.3
17	13	134	0.8	1.8	2.25	1.5	24.0	24.0	1.00	29.0
17	16	104	0.8	2.1	2.56	1.7	28.0	28.0	1.00	25.8
18	13	88	0.8	2.0	2.67	1.5	17.0	23.0	1.35	16.0
18	14	134	0.7	1.7	2.43	1.2	19.2	24.0	1.25	28.5
18	14	153	0.7	1.7	2.43	1.2	22.0	24.0	1.09	22.0
19	14	112	0.8	2.0	2.63	1.5	26.7	28.0	1.05	25.7
19	14	112	0.8	2.0	2.63	1.5	26.7	28.0	1.05	32.6
22	15	84	0.8	1.9	2.47	1.4	21.0	27.0	1.29	29.8
22	15	84	0.8	1.9	2.47	1.4	34.0	37.0	1.09	41.0
23	14	112	0.8	1.8	2.22	1.5	16.0	24.0	1.50	35.5
28	15	224	0.9	2.1	2.28	1.9	25.0	31.0	1.24	38.7
29	15	134	0.9	2.0	2.35	1.8	32.0	36.0	1.13	28.8
29	15	134	0.9	2.0	2.35	1.8	31.0	37.0	1.19	28.2
30	20	205	0.8	2.0	2.50	1.7	43.0	50.0	1.16	50.6
30	15	246	0.9	2.3	2.65	2.0	34.0	41.5	1.22	34.3

Trawler Size (GT)	LOA (m)	Engine Power (kW)	Dimension of OB		Ratio between Length and Height of OB	Area of OB (m <sup>2</sup> )	Length (m) of		Ratio between Ground rope and Head rope	Overall Net length (m)
			Height (m)	Length (m)			Head rope	Ground rope		
30	17	187	1.0	2.4	2.47	2.3	36.0	40.0	1.11	40.1
30	17	160	1.0	2.3	2.37	2.2	49.5	54.0	1.09	47.0
33	18	134	0.9	2.0	2.35	1.8	22.0	28.0	1.27	25.6
33	18	134	0.9	2.0	2.35	1.8	34.0	39.0	1.15	40.5
35	17	224	0.9	2.2	2.53	1.9	34.0	38.0	1.12	37.7
37	22	175	0.9	2.2	2.39	2.0	32.0	36.0	1.13	41.3
40	16	224	1.0	2.4	2.53	2.4	37.0	45.0	1.22	40.0
42	16	269	0.9	2.2	2.42	2.0	21.0	28.0	1.33	33.5
42	20	169	0.9	2.1	2.28	1.9	26.0	32.0	1.23	46.4
50	24	317	1.2	3.0	2.51	3.6	31.0	35.0	1.13	49.5
60	18	183	1.1	2.1	2.00	2.3	33.0	36.0	1.09	35.5
60	25	298	1.0	2.4	2.47	2.3	40.0	46.0	1.15	45.4
64	21	283	1.1	2.4	2.14	2.7	37.0	40.0	1.08	49.8
69	22	283	1.1	2.2	1.93	2.4	28.4	32.4	1.14	120.0
135	20	373	1.2	3.0	2.51	3.6	31.0	39.0	1.26	59.8
135	20	373	1.2	3.0	2.51	3.6	31.0	39.0	1.26	45.1
141	22	373	1.2	2.3	1.91	2.7	29.6	36.4	1.23	56.0
141	22	373	1.2	2.3	1.91	2.7	30.4	36.0	1.18	46.9

**Remark:**

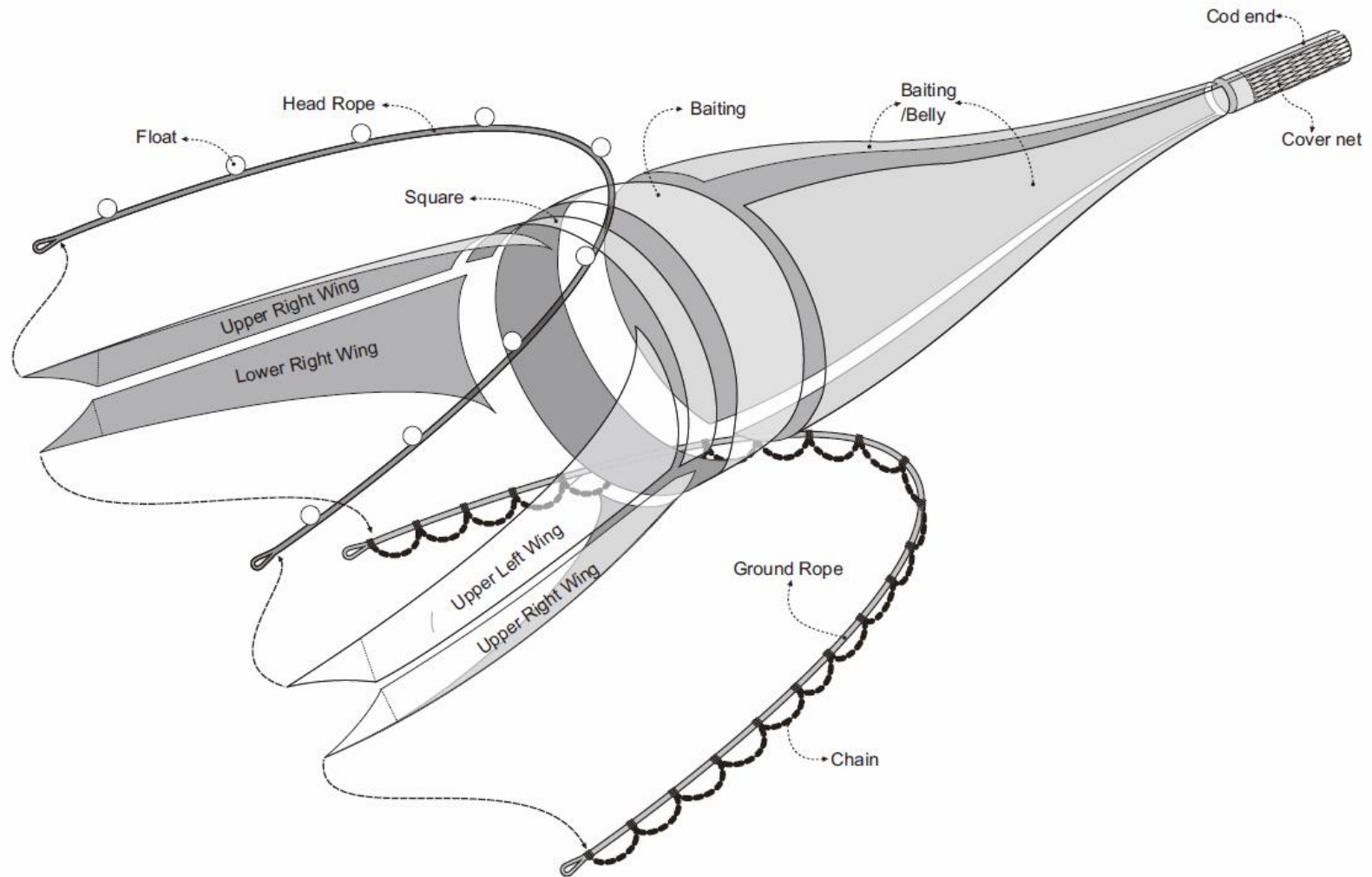
**GT:** Gross tonnage

**LOA:** Length Overall

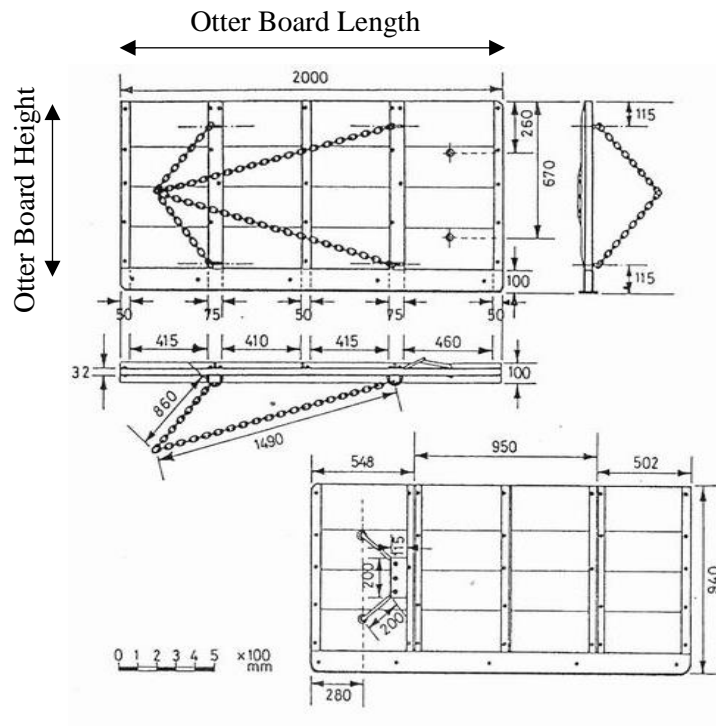
**kW:** Kilowatt

**OB:** Otter board

**Annex 3:** Trawl net composition (Figured by Narong Ruangsivakul)



**Annex 4:** Otter Board (Source: SEAFDEC, 2004)



**Annex 5:** Length Overall (Source: SEAFDEC/TD, 1988)

1. Length Overall (LOA): Horizontal distance between forefront of ships bow and rear end of the ship's stern
2. Length between perpendiculars (LPP): Horizontal distance between fore perpendicular and after perpendicular. There are 2 definitions used in LPP, i.e.  
 F.P. Perpendicular at forefront of the stem at the level of load water line  
 A.P. Perpendicular at rear-end of the stem frame at the level of load water line

