# HYDRODYNAMIC RESISTANCE OF TRAWL NETS IN THE EAST COAST OF PENINSULAR MALAYSIA

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## Introduction

Trawl net was first introduced from Thailand to Pulau Pinang, Malaysia in the early 1960's. It has been used by fishermen in Terengganu since early 1970's and has since been the most important gear in Malaysia. In 1995, trawl landed 55% of the total marine fish landings in Peninsular Malaysia. Trawl fishing industry has been experiencing high cost operation due to hydrodynamic inefficiency of trawl gears and depletion of resources that leads to lesser catch and longer trawling time to make up for the low catch rate. Improving the hydrodynamic efficiency of trawl gears will in general make the fishing operation more economical. Thus information on the efficiency of trawl gears will in general make the fishing operation more economical. Thus information on the efficiency of trawl nets with respect to hydrodynamic resistance is inevitable for the construction of resistance-efficient trawl nets. The objective of this paper is thus to determine the main structural characteristics that affect the hydrodynamic efficiency of trawl nets.

## Materials and Methods

Common structural characteristics of three trawl nets were measured in each state of Kelantan (K1, K2 and K3), Terengganu (T1, T2 and T3) and Pahang (P1, P2 and P3). The structural characteristics were the length of Head rope, Ground rope, Total length, Maximum circumference, Upper wing, Lower wing, Baiting, Cod end, Square and the average value of diameter per mesh bar of netting cord. All the trawl nets sampled were of the commercially operated bottom trawls in Zone B fishing grounds (between 5 – 12 nautical miles off the coastline). Hydrodynamic resistance of all the trawl nets were theoretically estimated using Shu's empirical formula which requires the values of maximum circumference of nets, length of mesh bar, diameter of twine and towing velocity. For the estimation of net resistance, towing velocity was assumed to be 1.54 m/s (3 knots), which is a normal towing speed of bottom trawling. The trawl net details of the structural characteristics and the net resistance. The relationships between the net resistance and the structural characteristics of the net were then determined.

## Results and Discussion

The net resistance and the structural characteristics of the nine trawl nets were tabulated in the Table 2. It was found that the range of net resistance varied from 838 to 1926 (Kgf). The values of the structural characteristics were also found to vary widely for all the nine nets. The length (m) of Head rope varied from 27.30 to 71.00, Ground rope from 35.00 to 80.00. Total length from 35.23 to 74.27, Maximum circumference from 59.44 to 104.39, Upper wing from 11.28 to 23.16, Lower wing from 13.87 to 28.04, Baiting from 18.28 to 36.32, Codend from 3.07 to 9.91, Square from 2.59 to 4.88 and the average of mesh bar per diameter of netting cord from 0.0035 to 0.0049. Using linear regression method, the net resistance was found to have strong correlation only with the stretched length of maximum circumference with a correlation coefficient of 0.9228. It can be interpreted here that the n et resistance increases with the increase in the stretched length of maximum circumference. The results show that the net T3 has the least resistance and net T1 has the highest resistance.

## Conclusions

This study shows that the maximum circumference of a trawl net is directly proportional to the resistance produced. Reducing the maximum circumference will significantly reduce the hydrodynamic resistance of trawl nets.

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