PROPER CONSTRUCTION AND SET UP OF MALAYSIAN FISH AGGREGATING DEVICES (UNJAM)

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PROPER CONSTRUCTION AND SET UP OF MALAYSIAN FISH AGGREGATING DEVICES (UNJAM)

By

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This work is dedicated to beloved wife:

Saidah @ Rohani Ibrahim

and sons:

Mohd. Hafizuddin

&

Ahmad Fadhli

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LIST OF ABBREVIATIONS

Wt	=	Weight of Sandbag
T	=	Rope Tension
F	=	Frictional Force
W'	=	Vertical Component of T
K	=	Fixing Coefficient
w	=	Weight of Tension Meter
r	=	Readings Registered on the Balance
t	=	Readings Registered on the Tension Meter
A	=	Total Area of Model Water
m	=	The Cost of Catching a Unit Quantity of Fish (in $)
mF	=	The Cost of an Unjam (in $)
MFAD	=	The Total Cost of All Unjams (in $)
Mo	=	The Basic Cost Incurred for Installing All the Unjams (in $)
C	=	The Number of Fish Caught at the Unjam
NF	=	The Number of Unjams in the Model Water
Ng	=	The Total Quantity of Fish in the Model Water
E	=	The Catching Efficiency
S	=	Area for One Unjam
Se	=	Area of the Effective Range of an Unjam
	=	$\Pi(\text{Radius})^2$
k	=	Density Coefficient of Fish Population Defined as k = Ng/A
	=	Quantity of Fish Per Unit Area

W = Width of Model Water

L = Length of Model Water

v = Speed of Water Current

V = Average Cruising Speed of Fish

S = Step-Length of Fish

R = Radius of the Effective Range

Abstract of thesis submitted to the Senate of Universiti Pertanian Malaysia in fulfilment of the requirements for the degree of Doctor of Philosophy.

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Faculty : Fisheries and Marine Science

This study was carried out with an objective of improving the durability of unjams and determining the rational arrangement and optimum density of unjams. Several experiments were conducted in coastal waters of Terengganu in the South China Sea to determine a safe anchoring power of unjams and parameters required for the development of mathematical models that could produce an optimum trapping efficiency.

Experiments on anchoring power showed sandy bottom giving the highest value of fixing coefficient (0.953), followed by muddy bottom (0.903), and sandy-mud bottom (0.731). This value was found to be higher for two sand-bags tied one behind the other than for two sandbags tied in one lump. The unjam's anchor was found to have a

reserved fixing force of 67.34 kg, which is 93.86% in excess of what was required to anchor an unjam in place.

Utilizing the required parameters; current pattern in the area, effective ranges of the unjams, and fish movement pattern, three mathematical models were developed.

The Linear model was found to be unrealistic and invalid.

The Non-Linear model enables the derivation of optimum catching efficiency graphically. With an area of model water of 30 km x 10 km and two different effective ranges of 0.18 km and 1.6 km, the number of unjams required were found to be 256 and 14 respectively, and the cost of catching a unit quantity of fish, m, was found to be 0.2714/k and 0.003892/k respectively.

The Uni-Directional Random Walk model involved the development of a mathematical model. The results of computer simulations of the model showed that, when the effective range was 0.18 km, 75 unjams were needed with a total trapping probability of 0.272 and a total cost of $19,836. When the effective range was 1.6 km, 27 unjams were needed with a total trapping probability of 0.558 and a total cost of $7,356. The total trapping probability estimated here is found to be fairly high. However, this value could be reduced if a lower percentage of trapping is considered.