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Saya **NOOR AMIRA SYUHADA BINTI MAHAMAD SALLEH (890104-02-5550)**

(HURUF BESAR)

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FISH IDENTIFICATION BASED ON ECHOGRAM

NOOR AMIRA SYUHADA BINTI MAHAMAD SALLEH

This thesis is submitted as partial fulfillment of the requirements for the award of the Bachelor of Electrical Engineering (Electronics)

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"I hereby acknowledge that the scope and quality of this thesis is qualified for the award of the Bachelor Degree of Electrical Engineering (Electronics)"

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Specially dedicated to
My beloved parents

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ABSTRACT

Echo sounder is devices used by the researcher or fishermen to detect of fish abundance in the deep sea area. Echogram as an image presentation of echo sounder's reflection usually analyzed as ping-by-ping calculation to obtain target strength for specific species. An advance method for fish identification based on echogram using pattern recognition is deploying in this research.Few data of echograms on few species of fish has to be recorded and compared. The software analysis developed using MATLAB to identify the differences species of fish based on its image pattern of echogram. The results makes easier to identify specific fish species based on pattern of echogram rather than ping-by-ping calculation.

ABSTRAK

Echosounder adalah peranti yang digunakan oleh penyelidik atau nelayan untuk mengesan banyak ikan di kawasan laut dalam. *Echogram* sebagai persembahan imej pantulan *echosounder* biasanya dianalisa seperti pengiraan ping untuk mendapatkan kekuatan sasaran untuk spesies tertentu. Satu kaedah awal untuk mengenal pasti ikan berdasarkan *echogram* adalah menggunakan pengecaman corak .Beberapa data *echogram* bagi beberapa spesis ikan telah direkodkan dan dibandingkan. Aplikasi analisa melalui perisian yang dibina dengan menggunakan MATLAB. Analisa dijalankan adalah untuk mengenal pasti spesies perbezaan ikan yang berasaskan kepada corak imej pada *echogram*. Keputusan daripada projek ini menjadikan cara pengecaman spesies ikan adalah lebih mudah berdasarkan corak *echogram* bukannya pengiraan ping.

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LIST OF ABBREVIATIONS

RGB	Red Green Blue
HSV	Hue, Saturation and Value
MATLAB	Matrix Laboratory

CHAPTER 1

INTRODUCTION AND GENERAL INFORMATION

1.1 Background

The ocean is a very wide and hidden with various of physical phenomena. One of them is fisheries resources that challenge people to explore. This phenomena, leads the researcher to study fisheries resources more.

Fisheries acoustic then become a particular field hydro acoustic that has significant role on undersea research. As in heritance of hydro acoustic, fisheries acoustic has also two major divisions: active and passive one. By referred to Horne , active acoustic includes subjects such as echo sounder and sonar, where pulses of sound are transmitted into the water and reflect off objects such as fish, submarines, or seabed. The science of underwater acoustics was given its major impetus by the sinking of Titanic in 1912. This event leaded to the invention of ultrasonic echo ranging devices for iceberg detection [1].

An acoustic method for the detection of fish was first reported in the scientific literature in 1929. Continuous waves at a frequency of 200 kHz were directed across ponds containing goldfish. As the number of fish intercepted by the acoustic beam changed, so the amplitude of the signal recorded on an oscillograph varied. This work was published by Kimura in the Journal of the Imperial Fisheries Institute of Japan.

According to Sund, most important development was the paper recording echo-sounder by Wood which was used for surveys of cod, and is still widely employed. A flashing light echo-sounder made by the Marconi Company was also used at this time for detecting herring shoals but reported later by Balls in 1946.

From Cushing rapid advances in the application of echo-sounders to fishing occurred after World War II and they were also used for the estimation of relative fish abundance. For this purpose a technique of counting the numbers of millimetres of fish echo trace from the paper record was used.

For the next stage of development, attempts were made to count and size fish from their echoes .They were Mitson and Wood, 1962 and Cushing, 1964, but for various reasons these met with limited success. In 1965 , by Dragesund and Olsen it was mainly the use of an electronic integrator to process the fish echoes that marked the beginning of quantitative assessment of fish stocks by acoustic methods as we know it today .

For year 1971 ,referred to Middtun and Nakken,the development of these methods for fish stock estimation has progressed steadily during a period when major advances in electronics technology have taken place. As a result of these advances it is possible to process signals derived from fish echoes, fast and accurately, with equipment which is both reliable and stable. Attention is being increasingly directed toward aspects of fish behavior such as their orientation, density and distribution, all factors which can bias the results of an acoustic survey. Thought is also being given to the planning of surveys and the statistical manipulation of data to give the best possible measurement of abundance. In putting together this manual the authors have drawn on the experience and writings of many people in an attempt to provide a suitable amount of technical background and practical 'know-how' [2].

The first stage of the project is the data obtain by Echo Sounder and Echo Gram. **Echo sounder** by definition is a piece of equipment, especially on a ship, which uses sound waves to discover water depth or the position of an object in the water [3].

While **Echo gram** is defined as an image of a structure that is produced by ultrasonography (reflections of high-frequency sound waves).[4]

The element plays the main role in this project is **Target strength.** Target strength (TS) is defined by as 10 times the logarithm of the reflected intensity (I) at one meter from the fish, divided by the intensity which strikes the fish [1].

The analyzing part of the project is Image Processing. **Image processing is** the process for analyzing and manipulating images with a computer. Image processing generally involves three steps, firstly is to import an image with an optical scanner or directly through digital photography. Then, manipulate or analyze the image in some way. This stage can include image enhancement and data compression, or the image may be analyzed to find patterns that aren't visible by the human eye. The result might be the image altered in some way or it might be a report based on analysis of the image . For this project, the toolboxes of MATLAB will be used as the workspace for pattern recognition. When working with images in MATLAB, there are many things to keep in mind such as loading an image, using the right format, saving the data as different data types, how to display an image, conversion between different image format [5].

There were a billions species of fish in the deep sea. Each of the species has it own target strength. Expert used the differences of the target strength to identify the species of fish. There were few methods used by the expert to do a research on the target strength. The methods used by the expert are known as *in situ*, *ex situ*, and simulation.

In situ identification of marine organisms is important for both fisheries operations and scientific marine surveys. If a fisher knows the species composition of a fish aggregation prior to catching the fish, unwanted by-catches can be avoided. If a fisheries scientist can identify the species and size of marine organisms in situ, time consuming and costly sampling of the organisms can be reduced [7].

Ideally, TS estimates should be derived in situ where fish can be surveyed and monitored in their natural settings. Earlier studies have been successful at identifying in situ scattering sources because either the study systems were dominated by few species (Burwen and Fleischman, 1998; Daum and Osborne,1998) or acoustic data could be directly related to catch data (Foote and Traynor, 1988). However, in situ methods are not generally suitable in the shallow, turbid, and biologically heterogeneous systems characteristic of coastal water [8].

Most often the ex situ method has involved measuring TS of caged fish of known lengths and weights. In this way several biological and behavioral characteristics such as species, size class, tilt angle, directivity pattern, swimming speed, fish maturity, depth adaptation, and sometimes also swimbladder characteristics of the fish under study are known. In spite of the risk of unnatural conditions influencing the ex situ method, this method was chosen in the present study because of the inherent problems in getting well-defined conditions when measuring in situ [9].

The most effective way come after that is simulation. Simulation is very effective to measure the target strength with low cost. Researcher try to develop a simulation software which can be used to identify the fish. This method will reduce the processing time and importantly reduce the cost. By using the TS data , the software will be able to distinguish the species of fish.

1.2 Problem Statement

As we knew before, sonar is one of the method used to detect the fish by the fishermen in the deep sea area .In the study of Electrical and Electronic Engineering, we try to develop an advance method of image processing for fish identification based on echogram.

Echogram is a kind of visual presentation as a reflection from echosounder. In this case, this software development try to solve the problem in identify the differences species of fish based on the usage of echogram.

1.3 Objectives

- Develop a system on image processing in identify the species of fish.
    - ➢ To obtain the data from echogram (image presentation).
    - ➢ To compare the Target Strength between two or more species of fish.
    - ➢ To distinguish the species of fish by pattern recognition.

1.4 Scope of Project

In this project, we only want to focus on getting the effective and precise results but only required a few time to get the result practically. There are a few or some scopes of this project that has been recognized which are:

i. Species of fish

Limited our scope by choose the desired species of fish monitored from the beginning of this project. The type of fish will be determined by some characteristics:

a. Shape
b. Color
c. Physical looks

Table 1.1 : Species of fish with the TS

Species	TS from In situ measurement of fish (dB)	TS from KRM model of fish (dB)	TS differences (dB)
Decapterus meruadsi	-54.19	-52.52	1.67
Selar boops	-46.49	-46.97	0.48
Megalaspis cordyla	-44.70	-44.23	0.47
Alapes djedaba	-39.09	-38.72	0.37

From the data obtaining in the previous in paper titled Target Strength Fish Identification For Scad Species of The South China Sea by Dr. Sunardi for his thesis at Universiti Teknologi Malaysia ,only two type of fish will be used in this project. The chosen type of fish are Decapterus Meruadsi and Selar oops.

ii. Target Strength (TS)

There will be few TS of fish will appear on the image presentation by Echogram in Furuno FQ-80 Analyzer, but the desired TS will be obtained. The desired TS is the TS Value for Decapterus Meruadsi and Selar Boops. Only the TS with the colour indicator will undergo the image analysis, otherwise will be discarded.

1.5 Thesis Outline

Chapter 1 contains explanation on the introduction of the project which consists of the overview of the problem statement, objectives, and scope of image colour detection project.

Chapter 2 is more focused on literature review which is the research and studies of this project.

Chapter 3 views the methods that are used in completing the project from the beginning to the end. This includes project's flow, analysis, and all programming used in this project.

Chapter 4 present the full software development .Full development in MATLAB R2010a are discussed in this chapter.

Chapter 5 shows all the analysis and result from the analysis from the data collection and software development.

Chapter 6 concludes the overall of the project and which includes the problem and future recommendation for project in future development. The costing and commercialization issue will also be discussed here.

CHAPTER 2

LITERATURE REVIEW

2.1 Echogram

In previous researches done in fisheries field , echogram bring a lot of impact .From the paper published by Oxford University Press ,titled Spatial organization of pelagic fish: echogram structure, spatio-temporal condition, and biomass in Senegalese waters , Pierre Petitgas and Jean Jacques Levenez state that ,the analysis of echograms will provide detailed morphological descriptions of fish aggregations together with characteristics of their habitat. They used the presentation of the echogram to do the research on the fish and their habitat[10].

According to the paper titled , Sampling variance of species identification in fisheries acoustic surveys based on automated procedures associating acoustic images and trawl hauls , the researcher study on acoustic surveys of fish stocks, a small number of echo traces are identified to species by fishing. During data analysis, the process of echogram scrutiny leads to allocating echo-trace backscattered energies to species[11].

Echogram can be said as a visual representation of an acoustic variable . It is the principal window for quality control, editing and analysis of data. There are two types of echograms which is Single beam echogram and Multibeam echograms .Ts echogram is classified under single beam echogram. In TS echogram each data point on a TS echogram represents a Target Strength measured in decibels. Each data point is displayed in a color determined by the selected color scheme. The TS value may be read directly from the data file in some instances or calculated by Echoview from received power data stored in the data file [12].

2.2 Target Strength (TS)

Size and reflectivity of sound are combined into backscattering cross section, usually expressed in logarithmic and called as Target Strength (TS) .Variability in reflected sound is influenced by physical factors such associated with the transmission of sound through a compressible fluid, and the biological factors associated with the location, reflective properties, and behavior of the target[13].

TS can be measured or modeled but both approaches (in situ and ex situ) are constrained when quantifying the relative importance of biological or physical sources. In situ TS measurements incorporate ping-to-ping variability from ensonified organisms but do not permit independent measurement or the manipulation of sources that influence TS. Ex situ TS measurements using restrained fish of known length allow TS to be measured while controlling tilt and depth[13].

There are many methods used to measure TS, but examining factors in isolation is difficult. The effects of one factor can not be separated from the influence of other factors. TS can be measured in situ, experimentally, calculated from equation, or modeled based on fish anatomy. In fisheries application, TS data are collected by in situ measurement using sonar or echo sounder. TS value, depth, and position of targeted fish can be viewed at every ping by **recorded echogram**[13].

Furuno FQ-80 Analyzer allow fisheries to obtained the TS value, depth, and position of targeted fish can be viewed at every ping by recorded echogram .TS value, depth, and position (x-y-z) of single fish which detected at every ping at low or high frequency has been observed from Top View of TS as shown in Figure 6. This display shows the direction and depth of single fish[1].

2.3 Pattern Recognition

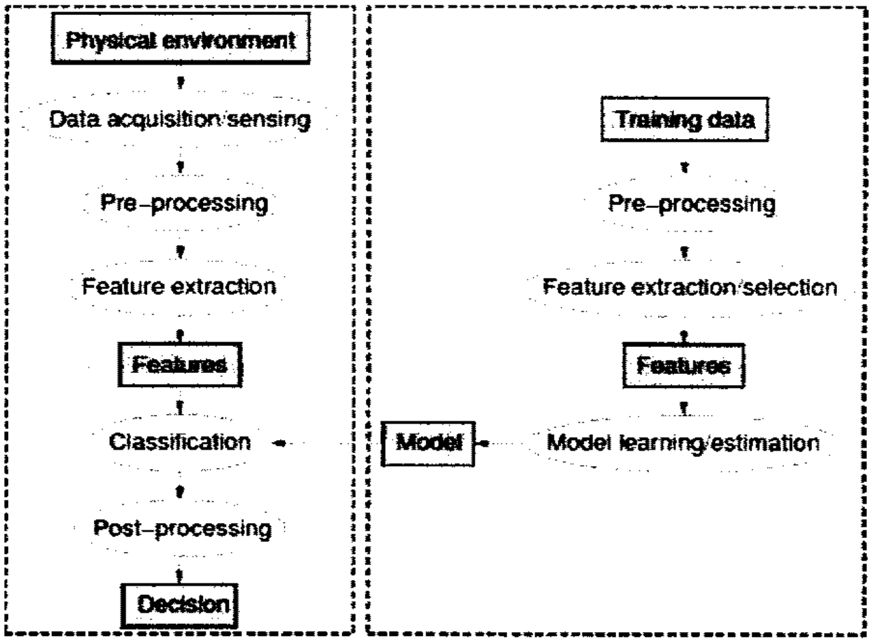

Figure 2.1: Example of process diagram of a pattern recognition [15].

From Selim Aksoy ,pattern recognition is the study of how machines can observe the environment or learn to distinguish patterns of interest. For this case the pattern recognition use to distinguish the selected species of fish

Some kind of information can be used to distinguish one species from the other. The parameters such ,length, width, and weight can be used to classify the fish species. In this case the features use is the Target Strength (TS) [14].

The steps involved in the pattern recognition process are shown in the figure below.

Figure 2.2: Flow chart of the pattern recognition

The process to obtain the pattern of the desired image need to go through the process of removing of noise in data. The normal environment of fish. Then, the next process is the isolation of patterns of interest from the background [15]. This step is to extract the patterns from the background. Hence the pattern will be vividly clear and make the decision easier to make.

Recognition and classification as a technique gained a lot of attention in the last years wherever many scientists utilize these techniques in order to enhance the scientific fields. Fish recognition and classification still active area in the agriculture domain and considered as a potential research in utilizing the existing technology for encouraging and pushing the agriculture researches a head [15].

Through this project the pattern recognition is not applied to the real fish. The recognition or the identification is done on the image of echogram that produced by Furuno FQ-80 Analyzer.

2.4 Colour Space

A color space is defined as a model for representing color in terms of intensity values [1, 2]. Typically, a color space defines a one- to four-dimensional space. A color component, or a color channel, is one of the dimensions. A color dimensional space (one dimension per pixel) represents the gray-scale space. In general, there are two models are commonly use in color image, that is RGB color model and Hue, Saturation and Value (HSV). However , only the RGB color model are chosen to implement in this system because RGB color model are usually use in display image and used most on computer generated image.

2.4.1 RGB color space

The RGB color space is a way of specifying colors based on the mixing of different colors of light. The RGB color space is an additive color space based on RGB color model. A particular color space is defined by the three chromatic of the red, green, and blue additive primaries. The complete specification of this color space is needed a white chromaticity and a gamma correction curve. Figure 2.3 show the RGB cube .

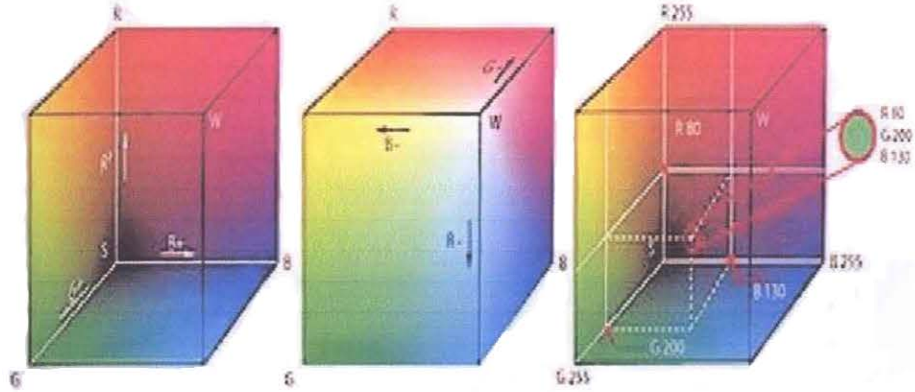

Figure 2.3: RGB cube

The RGB color space easily understood by thinking of all possible color where it made from three colorants that is red, green and blue. RGB are convenient color model for computer graphic because the human vision system works in a way that is similar to RGB color space [16].

2.4.2 RGB Color Model

From the color space, it was based on RGB color model. The RGB color model is composed of the primary colors Red, Green, and Blue. They are considered the "additive primaries" since the colors are added together to produce the desired color [1,3]. In color segmentation the RGB color space is most commonly used where each color is represented by a triplet red, green and blue intensity.

The RGB model uses the Cartesian coordinate system as shown in Figure 2.4(a). Notice the diagonal from (0,0,0) black to (1,1,1) white which represents the grey-scale. In figure 2.4(b) indicate a view of the RGB color model looking down from "White" to origin [17].

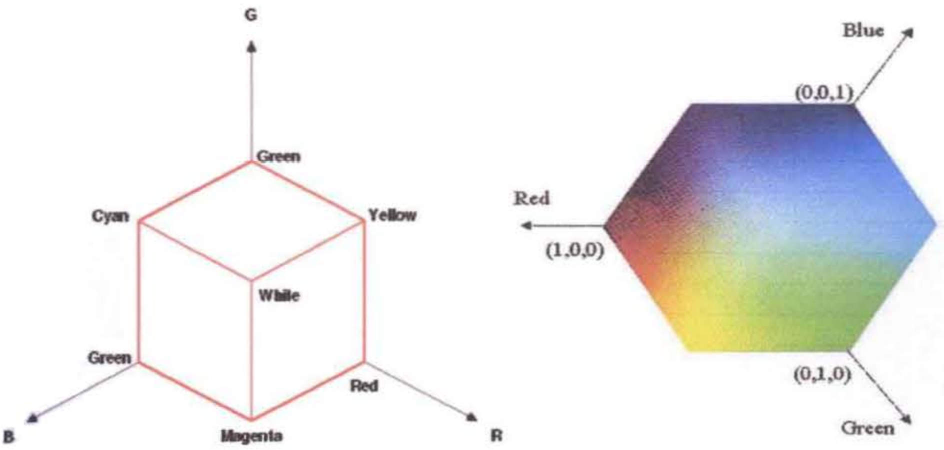

Figure 2.4: RGB model (a) Coordinate system and (b) view of RGB

CHAPTER 3

MATERIALS & METHODOLOGY

3.1 Introduction

This chapter brief on the design of Fish Identification based on Echogram. Materials of this study of fish identification are explained such as FQ-80 Furuno Analyzer echo sounder display, and MATLAB 2010 software for pattern recognition or identification.

Besides, this chapter discuss on the methodology on identification of the echogram by FQ-80 Furuno Analyzer then follow by the pattern recognition process through MATLAB Image Processing Tools.

3.2 General Design of Fish Identification

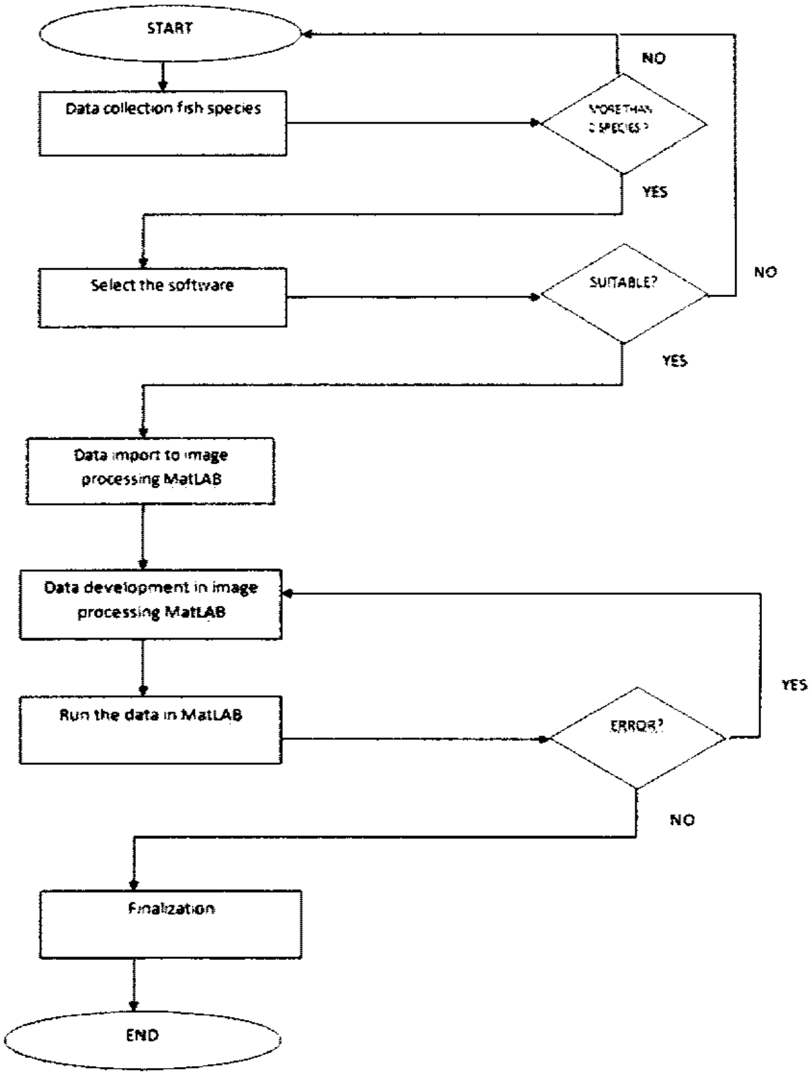

Figure 3.1: General flow of the system

Few species of fish are selected to be the "data target" in this project. To distinguish the "data target" should be more than two species. All the data are obtain from the echogram which the image presentation from the echo sounder. Few images will be selected to undergo image processing. The image processing done to "extract" the "target" image from the data image. The image processing will make the clear difference between few types of fish. The image processing will be done by the selected software. For the best performance produce by MATLAB, it is the most "essential" software to be used .All the data development will be done in this MATLAB workspace. Specifically the data development here refer to the development of "coding" to get the "color".

The color obtain, used from the process to identify the species easier. In details, the color indicate the Target Strength of the type of fish. Hence, the researcher will know the type of fish by the color produced on the image processing.

3.2.1 Fish

From the previous researcher , the Target strength of four commercial fish species of the South China Sea has been studied; there are Selar boops (Oxeye scad), Alapes Djedaba (Shrimp scad), Megalaspis Cordyla (Torpedo scad), and Decapterus meruadsi (Japanese scad). The photos of fish is shown below. But for this project , only two type of fish had been observed. Figure 3.2 and Figure 3.3 show the real image of the Decapterus Meruadsi and Selar Boops respectively. The Table 3.1 and Table 3.2 show the data arrangement for both types of fish. The tables show each single of File ID together with the number of ping , depth , and the TS value of the chosen type of fish. These data is extracted from the function of Furuno FQ-80 Analyzer which will brief in subchapter 3.4, Procedure to get the Ping location.

Figure 3.2 : Decapterus Meruadsi (Japanese Scad) [1]

Table 3.1: Decapterus Meruadsi TS data

File ID	Ping no	Depth (m)	TS (dB)
3684	15	1.82	-53.80
3684	28	1.22	-56.02
3684	32	1.62	-56.53
3684	64	1.18	-52.58
3684	76	1.18	-56.93
3684	94	1.18	-54.91
3684	99	1.86	-56.60
3684	100	1.89	-57.57
3684	104	1.66	-55.03
3684	146	1.30	-51.70
3684	173	1.89	-50.48
3684	184	1.70	-49.46
3684	185	1.74	-54.03
3685	15	1.78	-56.14
3685	16	1.78	-54.36
3685	17	1.78	-53.68
3685	18	1.82	-55.76
3685	20	1.26	-55.48
3685	29	1.93	-53.60
3685	30	1.97	-52.64
3685	31	1.97	-51.28
3685	34	1.22	-54.63
3685	72	1.34	-55.07
3685	94	1.62	-55.08
3685	104	1.34	-54.61
3685	109	1.22	-53.59
3685	120	1.42	-51.18
3685	140	2.01	-53.49
3685	141	2.01	-54.33
3685	151	1.62	-54.07

Figure 3.3 : Selar Boops [1]

Table 3.2 (a) : Selar Boops TS data

File ID	Ping no	Depth (m)	TS (dB)
3195	197	7.71	-40.89
3195	206	7.78	-42.70
3195	210	7.69	-41.71
3195	212	7.69	-43.31
3195	231	7.71	-42.23
3195	243	7.69	-45.93
3195	248	7.69	-41.51
3195	250	7.76	-42.83
3195	252	7.71	-43.70
3195	253	7.69	-41.96
3195	254	7.71	-43.56
3195	255	7.78	-42.88
3195	256	7.67	-44.34
3196	325	8.87	-45.95
3196	326	8.89	-44.56
3196	393	8.91	-44.20
3196	412	8.81	-41.30
3196	413	8.79	-42.28

Table 3.2 (b) : Selar Boops TS data

File ID	Ping no	Depth (m)	TS (dB)
3196	414	8.79	-43.06
3196	421	8.85	-46.61
3196	431	8.85	-39.74
3196	464	8.89	-47.03
3196	509	8.81	-41.30

3196	527	8.27	-36.28
3196	528	8.27	-36.99

3.2.1 Furuno FQ 80 Analyzer

Furuno FQ-80 Analyzer is the software used to get the TS of the fish.

Figure 3.4 - Figure 3.9 show how the Furuno FQ 80 Analyzer works.

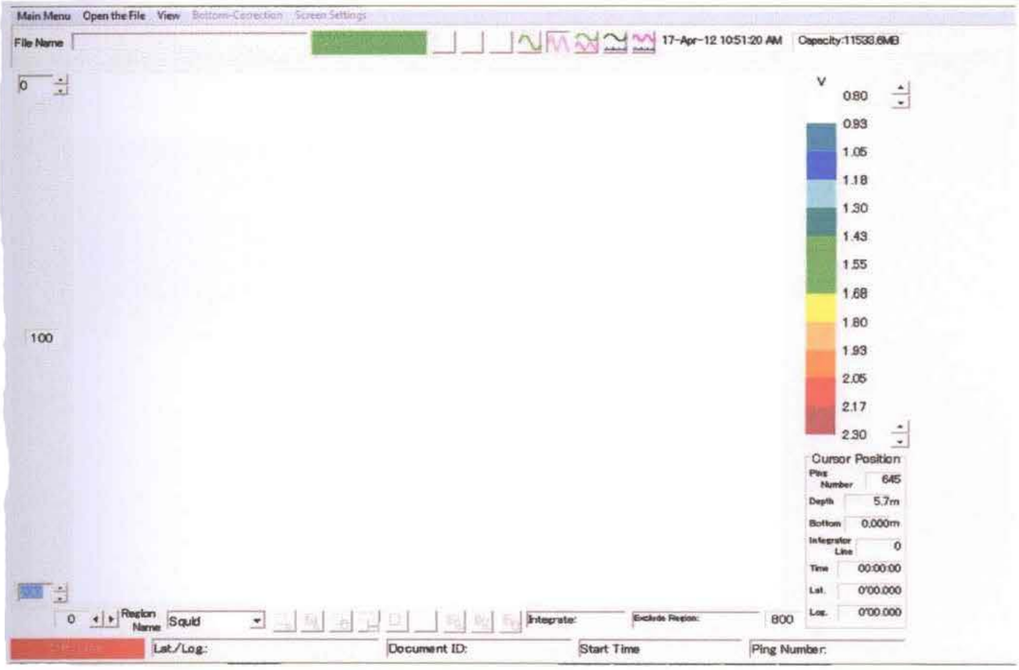

Figure 3.4: Furuno user interface

Figure 3.5: Furuno user interface for Selecting data

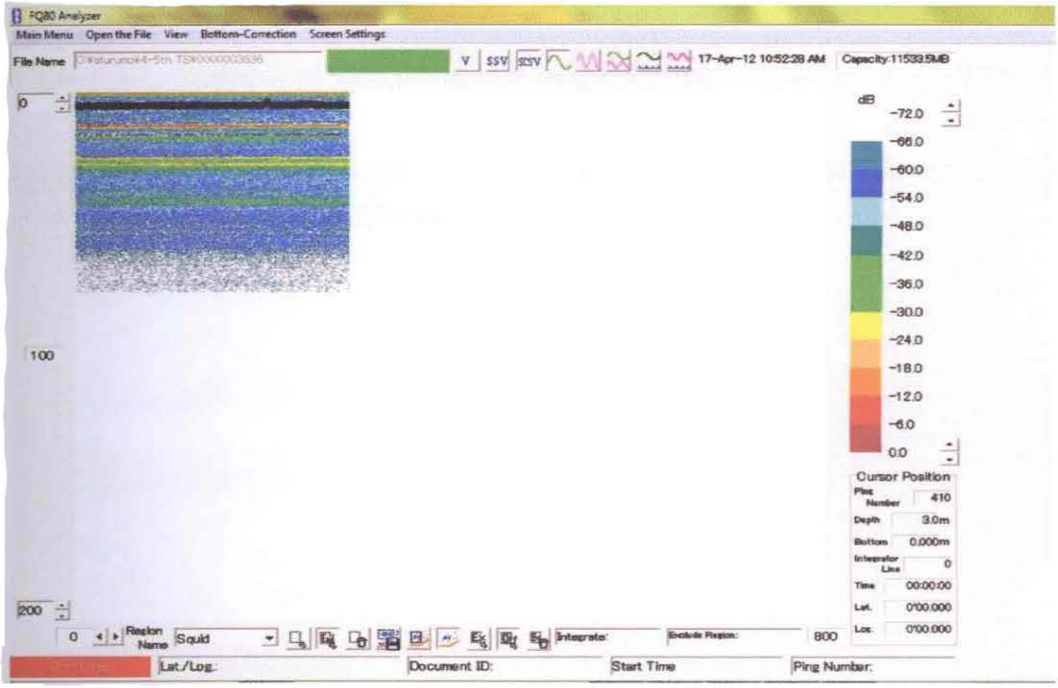

Figure 3.6: Example of data using low frequency with depth range 0 to 10m

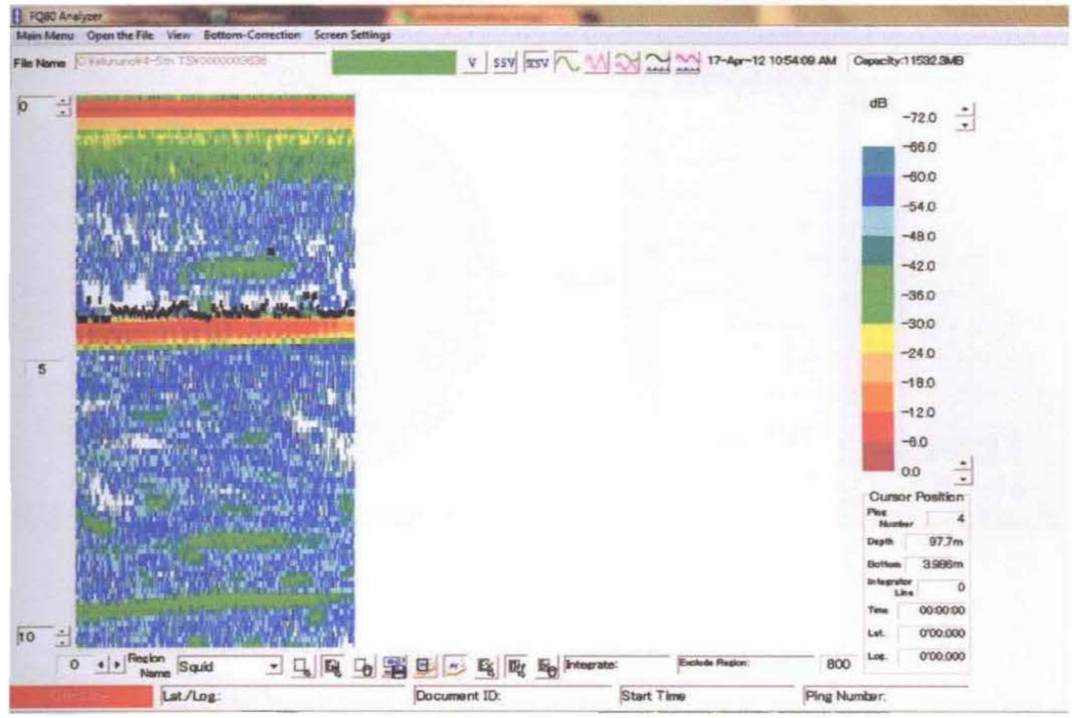

Figure 3.7: Example of data using low frequency with depth range 0 to 10 m

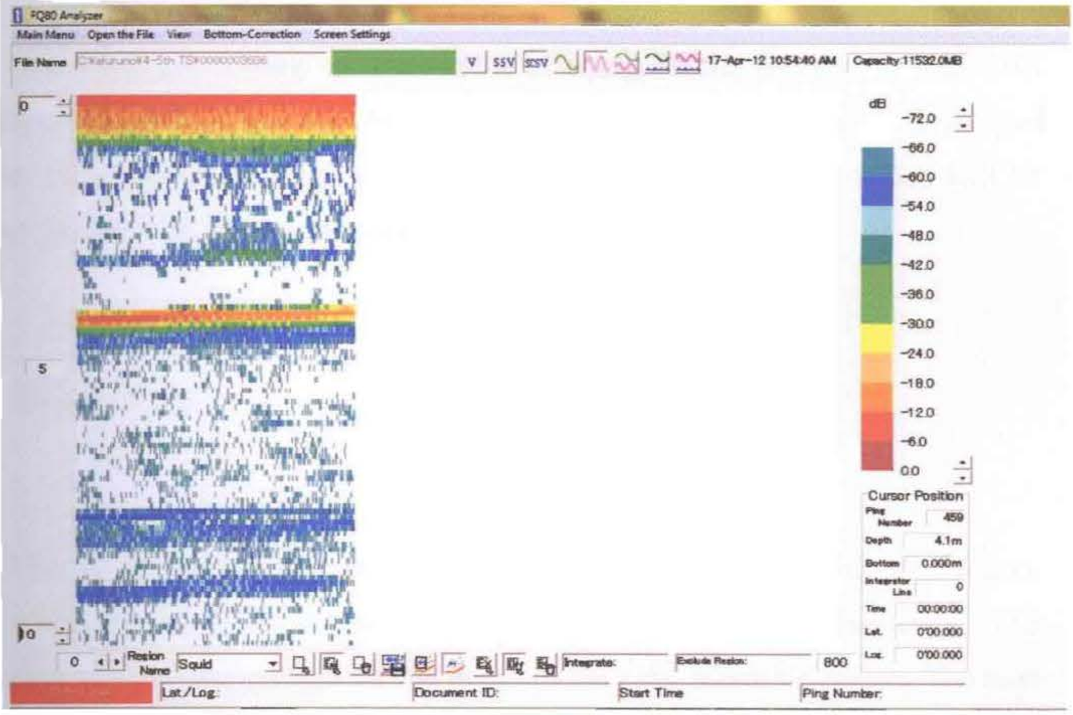

Figure 3.8:Example of data using high frequency with depth range 0 to 10 m

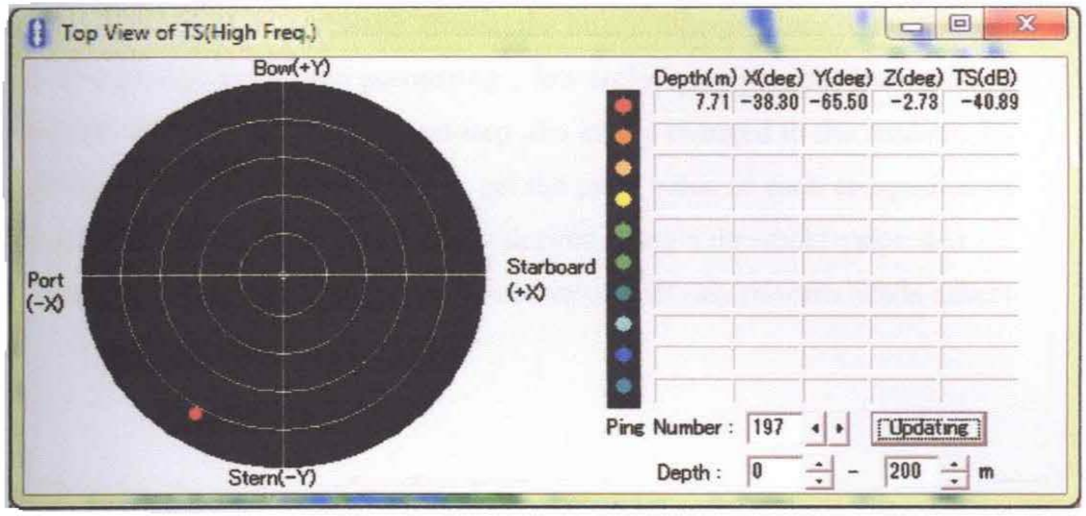

Figure 3.9:Topview of TS

3.2.2 MATLAB R2010a Software

The image processing is executable by using M-File from MATLAB . All the program development done in M-File. The identification program all developed and run by using Image Processing Tools with the appropriate source which will be discuss in Chapter 4 , Software Development.

3.3 System Flow

The methodology start with obtaining image display on FQ 80 Furuno. Image displayed with the option of low frequency and high frequency. The echogram displayed can manipulate the depth of the echo sounding region. The next material used in pre-processing is Paint. The image is then saved in the PNG format. The PNG format used because it provide the best quality of image compared to JPEG format.

The image represent in three-sample per point format which is RGB image. This is the stage of data preparation. The next material used for purposed of identification is MATLAB Software .Hence, the image then go through the process of Image Processing. In image processing , few techniques proposed to enhance and the identify the type of the fish. First step ,the image changed to the readable by MATLAB Software. This process done to get the pixel value of each component of the colour arrays. Then we detect the colour desired using a threshold value that we have set. In this operation, the desired threshold value will stay remains while others removed .

3.4 Image Processing Flow Chart

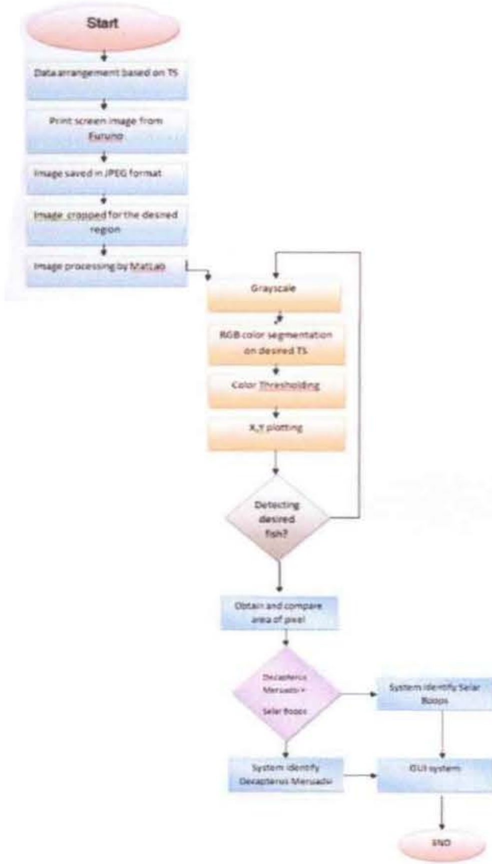

Figure 3.10: Image processing flow chart

3.5 Procedure to get the Ping location

Figure 3.11 show the how the ping value is obtained based on the data recorded by the previous researcher. The data from the researcher give the information about the location of the fish by the axis. The information used as the parameters to find the ping location in the image display.

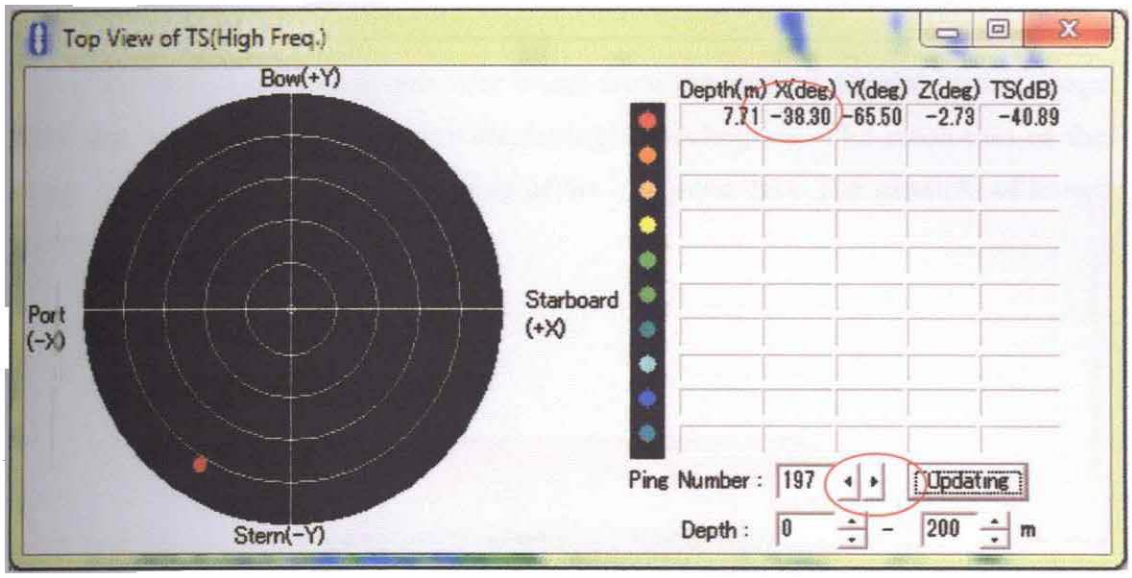

Figure 3.11: Figure show how the data obtained

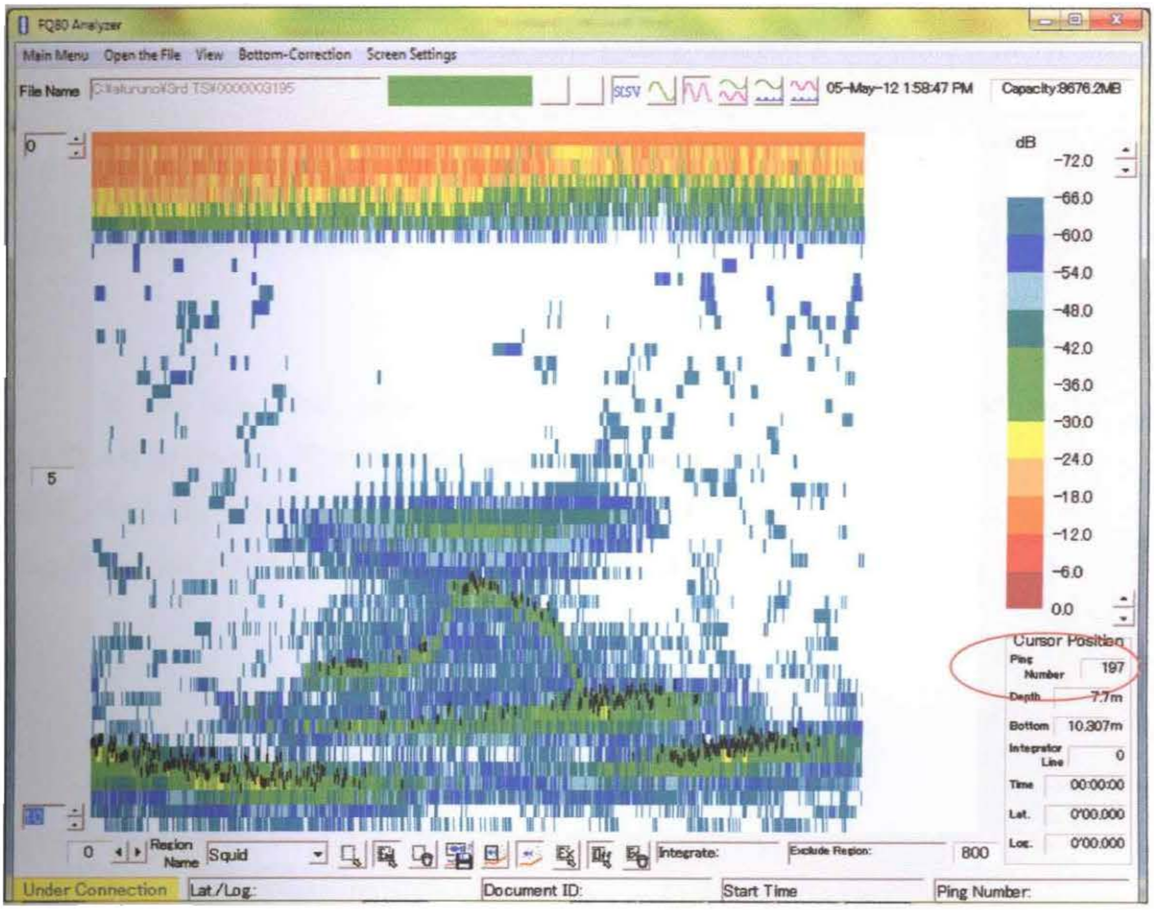

Figure 3.12: Figure show how the data obtained

3.5.1 Image Acquisition

For this stage , we acquire the image from the method of print screen image from the Furuno FQ-80 Analyzer displaying the echogram. The resolution of the image change depend on the total ping of the recorded data. The example of image is shown in the figure below.

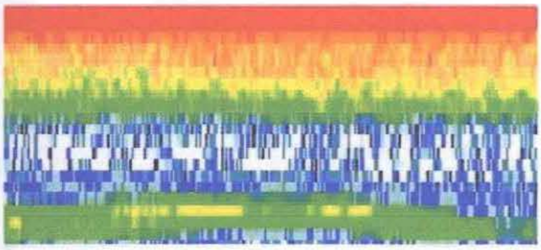

Figure 3.13: Image capture from Furuno FQ-Analyzer

3.5.2 Image pre-processing

In this step , the original image be processed to the format readable by MATLAB Software. The original image is the image of the combination of the RGB. Then the image represented in three arrays represented by red , green, and blue. After that the image converted to 255 level gray-scales using rgb2gray.

3.5.3 Image Processing

The fish identification based on Furuno FQ-80 Analyzer need the user to differentiate the color of the difference of TS by their ordinary vision .This will require more time and expertise to identify the fish.

By vision system programmed by MATLAB software the identification will be more easier. This system used colour processing to detect the TS of the desired

In this stage the image of the echogram then being processed. For the first stage, the technique used is the colour detection. The target colour referred to the target strength of the fish. For this analysis we used two values of the TS.

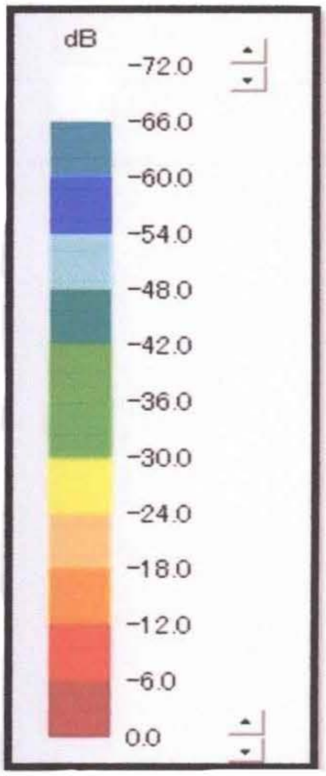

Figure 3.14 :The colour indicator

Based on the scope of this project , only two value of TS used for identification. The two values are for Decapterus Meruadsi and Selar Boops.From the research paper that used in this project the TS value for Decapterus Meruadsi is -54.19 dB and Selar Boops is -46.49 dB.

Table 3.3 : Colour indicator with the TS value respectively.

Colour Indicator	TS (dB)
	-54.00 to -60.00
	-42.00 to -48.00

Table 3.4 : Colour indicator with the TS value presented the type of fish

Colour Indicator	TS (dB)	Type of fish
	-54.19	Decapterus Meruadsi
	-46.49	Selar Boops

CHAPTER 4

SOFTWARE DEVELOPMENT

This chapter brief on the software development part to process the echogram image.This chapter cover the source code and syntax used in MATLAB .

4.1 Introduction

In this project, a software program was produced by using Image processing in MATLAB software. Therefore MATLAB software was the essential tool used throughout the whole software program development progress.

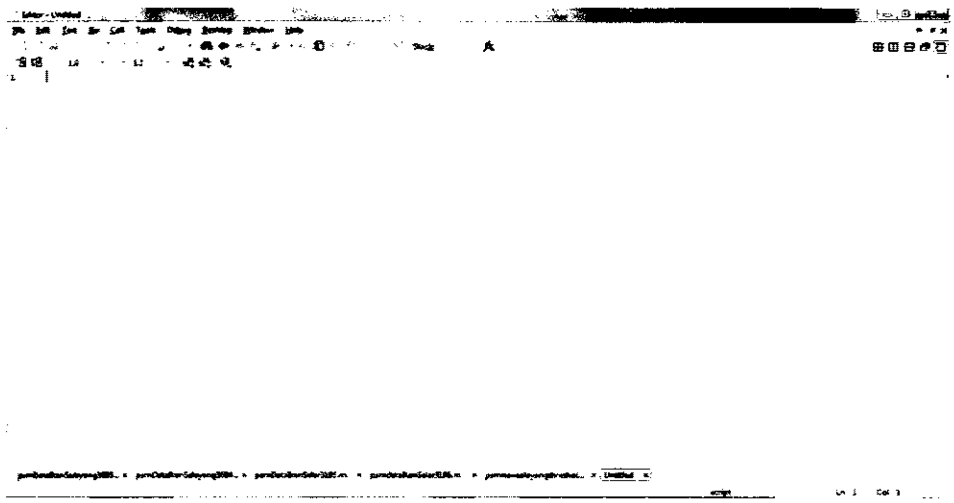

Figure 4.1 : New blank M-File

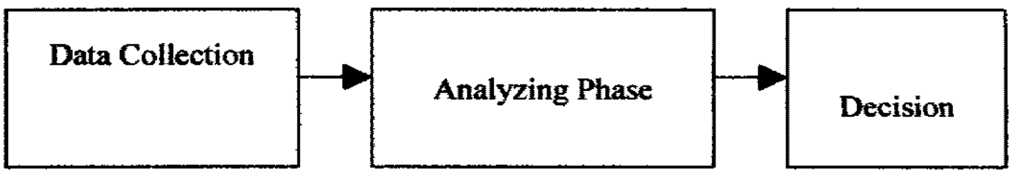

Figure 4.2 : Three main phases of the project

4.2 Data collection

To run this project, we need to load image from the database of echogram display. The image will appear at the figure and will get maximize figure.

The "imread" syntax used to import an image from any supported graphics image file format. The " ('*.png')" is described the type of image are located at the current directory. The error occur if the other type of image is used but the directory not similar.The error of select image will appear in command window. For several types of image, the coding need to be modified within put in all of image are saved before.

The "imshow" syntax displays the RGB image of the input image. The image will display as a title 'Original RGB Image'.

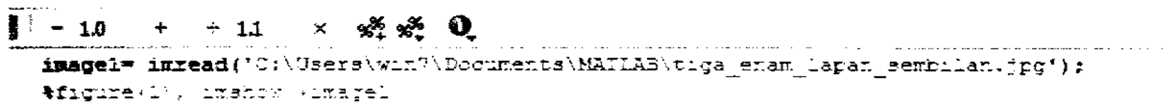

Figure 4.3 : Programing for show the image

Together with this the syntax "impixel " and "iminfo " also used to show the RGB and the coordinates of each single pixel. The output from this syntax will discuss in Chapter 5 , Result and Discussion.

```
dataSelayang=imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapan_empat.png');
b=dataSelayang;
figure(1),imshow(dataSelayang)
[r c d]=size(dataSelayang);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==67 && loop2==26
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==100 && loop2==29
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
             elseif loop1==71 && loop2==78
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==70 && loop2==99
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==111 && loop2==99
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==111 && loop2==101
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==94 && loop2==94
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==96 && loop2==96
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);

            else
                dataSelayang(loop1,loop2,loop3)=0;
            end
        end
    end
end
```

Figure 4.4 : Programming to get the desired pixel of the fish

From the figure 4.4, it shown that step of development to get the desired pixel of the fish of RGB image samples. The output for this program will give result as in the Result and Discussion chapter.

4.3 Thresholding in RGB color space

These commands for read the image of echogram in the database.

dataSelayang=imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapan_empat.png');

For closer inspection of the RGB color space, the next block of code displays the separate color planes (red, green and blue) of an RGB image.

red=data (:,:,1);
green=data (:,:,2);
blue=data (:,:,3);

In purpose to get the average RGB processed by MATLAB , the command executed is shown below.

average_red=sum(sum(red))/number of data;
average_green=sum(sum(green))/ number of data;
average_blue=sum(sum(blue))/ number of data;

4.4 Identification

Hence the final software development is to show the image with the color automatically identify by the software development.

```
dataIkan= imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapan_empat.png');
figure(1), imshow (dataIkan)
red=dataIkan(:,:,1);
green=dataIkan(:,:,2);
blue=dataIkan(:,:,3);
dataIkan_gray=rgb2gray(dataIkan);
%figure(2),imshow(s_gray);
%filter to remove other color
[r c]=size(dataIkan_gray);
for loop1=1:r
    for loop2=1:c
        if  red(loop1,loop2)>33.875||red(loop1,loop2)<30.875||...
            green(loop1,loop2)>81.9875||green(loop1,loop2)<80.875||...
            blue(loop1,loop2)>178.575||blue(loop1,loop2)<170.575;
            dataIkan(loop1,loop2,:)=255;


        end
    end
end

figure(2), imshow (dataIkan) , title ('Ikan Selayang');
```

Figure 4.5 : Programming to identify the fish

4.5 Decision

To classify between two types of fish , the area of desired pixel is calculated by the syntax below.

%total area 1
BW=im2bw (image1 ,0.1);

%total area 2
BW2=im2bw (image2 ,0.1);

Then all source codes are combined in GUI to let it easier to used by researcher. GUI source is attached to the ***Appendix***.

CHAPTER 5

RESULT AND DISCUSSION

The identification of the fish continued with the findings by using few steps discussed in Chapter 3 and the contribution of software development in MATLAB which discussed in Chapter 4.Here the expected result is verify by the stage by stage findings. Lastly, the analysis of the identification is discussed intensively.

The analysis of the fish identification by the programming from MATLAB has done by acuire the pictures for file recorded in the previous research, where there represents three File ID for Decapterus Meruadsi and two File ID for Selar Boops. From the average value calculated by MATLAB R2010a , it used to identify the type of fish shown in the echogram.

The result is discussed stage by stage by following the step of Computer Vision System approach.

5.1 Image Acquisition

By using the data obtained by from Furuno. Two data had been chosen to be identified by using the system. From the Furuno FQ-80 display , the data obtained is shown below. Figure 5.1-5.4 show the image of echogram for the chosen File ID 3684 , File ID 3685 , File ID 3686 , File ID 3195 , and File ID 3196 respectively.

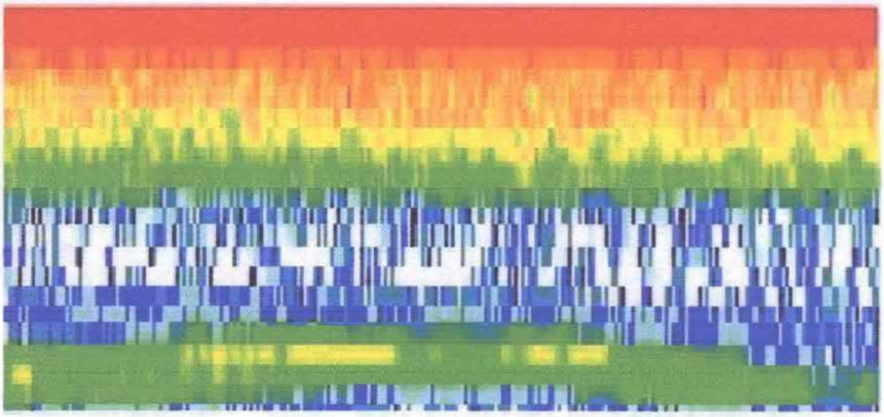

Figure 5.1 : File ID:3684 with depth from 0 m to 2m (not the real scale)

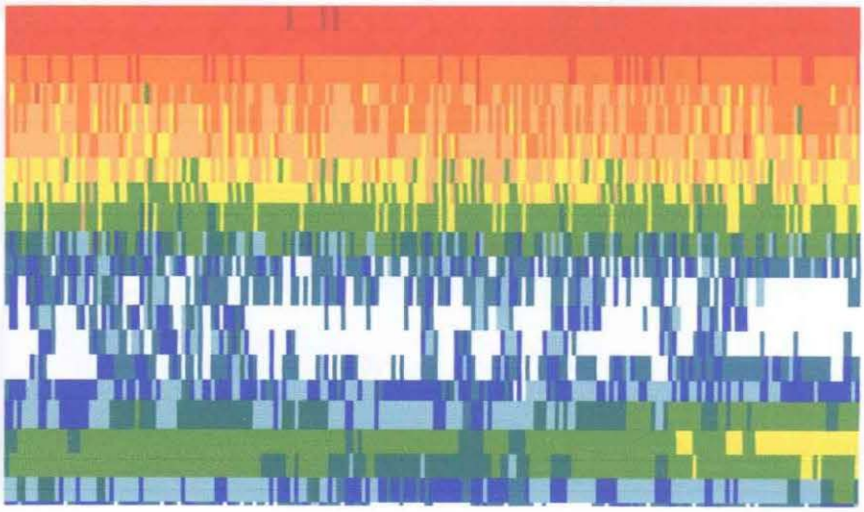

Figure 5.2: File ID:3685 with depth from 0 m to 2m (not the real scale)

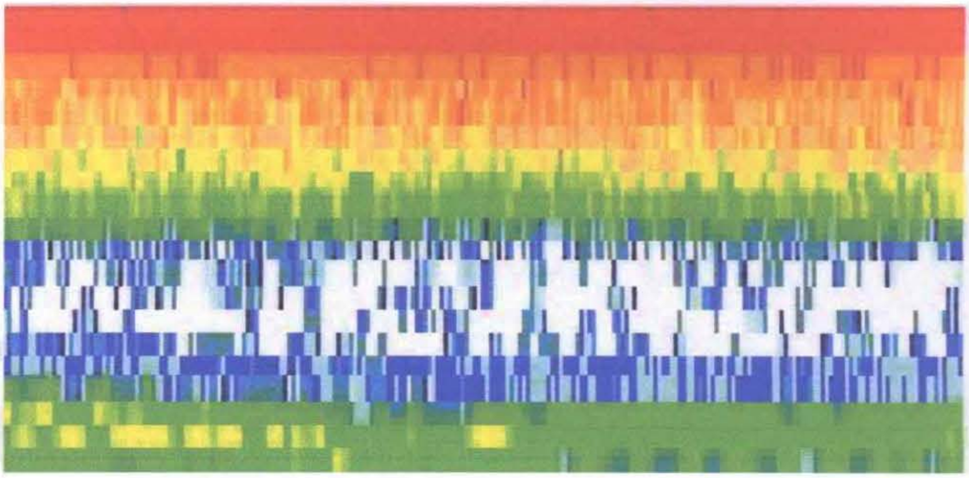

Figure 5.3: File ID:3686 with depth from 0 m to 2m (not the real scale)

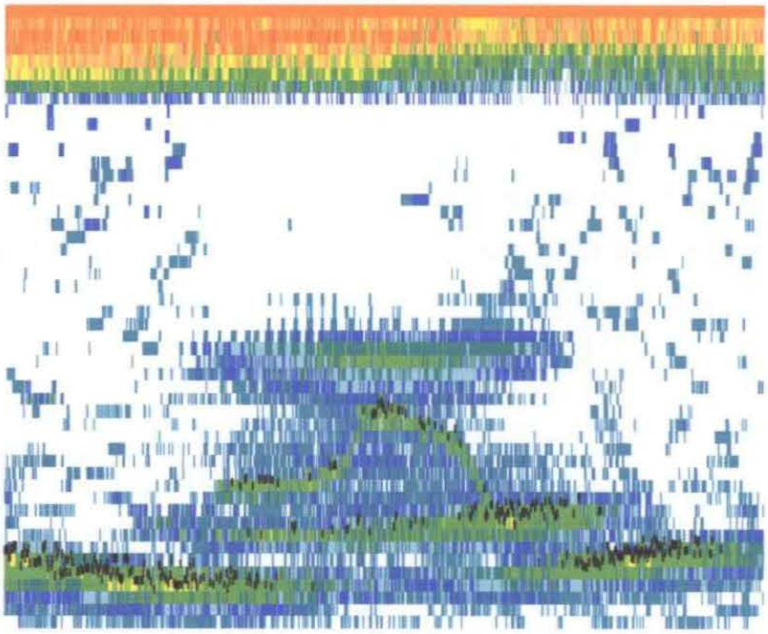

Figure 5.4: File ID:3195 with depth from 0 m to 10m (not the real scale)

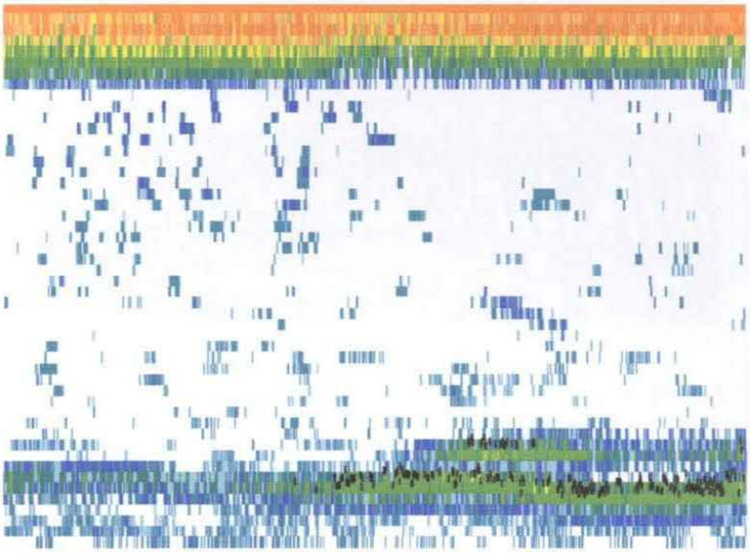

Figure 5.5 : File ID:3196 with depth from 0 m to 2m (not the real scala)

The data show above is the data obtained from the File ID 3684 From the Decapterus Meruadsi Fish. image of echogram is cropped to the desired depth. For File ID 3684 , the depth used is 2.0 m. The total ping of the echogram is differences from each single File ID. This happened because of the data recorded during the measurement.

5.2 Pre –Processing

Image of echogram changed to readable file by Matlab to be processed by Image Processing Tools in Matlab. Hence, the result from Pre-Processing to make the file readable by Matlab is show in figure below.

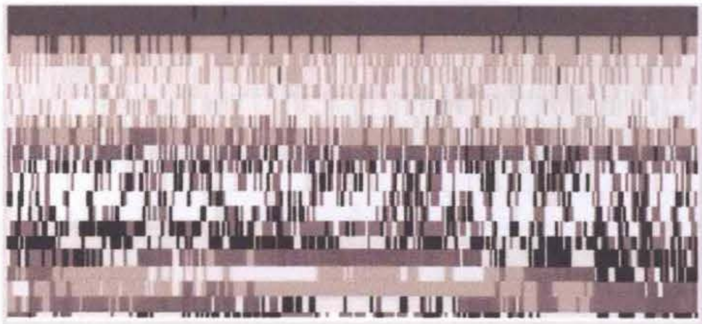

Figure 5.6 :The grayscale file show above is the image taken from File ID 3684

5.3 Image Processing

By getting the location of the "desired Ping" or the desired pixel , the processed continue in Image Processing part by analyzing the Color Threshold on each single pixel.As for the result , the only desired pixel obtained in the processed image. The finding of selecting the desired pixel are shown below.

5.3.1 Decapterus Meruadsi

Table 5.1 (a) : Decapterus Meruadsi File ID

File ID	Pixel	
	X	Y
3684	26	67
	29	100
	78	71
	99	70
	99	111
	101	111
	94	94
	96	96
3685	17	100
	18	100
	21	100
	37	72
	95	94
3686	7	101
	9	102
	13	97

Table 5.1 (b) : Decapterus Meruadsi File ID

File ID	Pixel

	X	Y
3636	45	100
	53	100
	57	106
	72	92

Processing the data above, one software had been develop based on the pixel location of the ping. The result are as figured below.

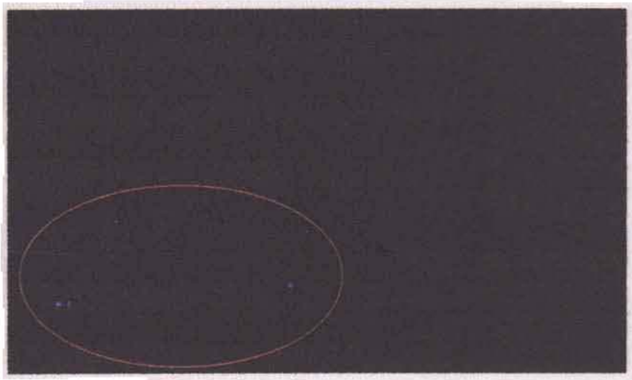

Figure 5.7 : File ID:3684

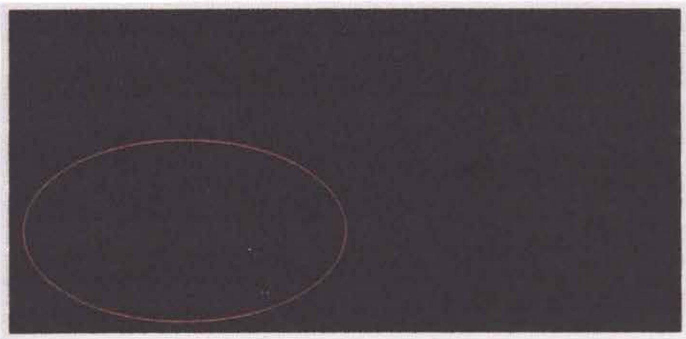

Figure 5.8: File ID:3685

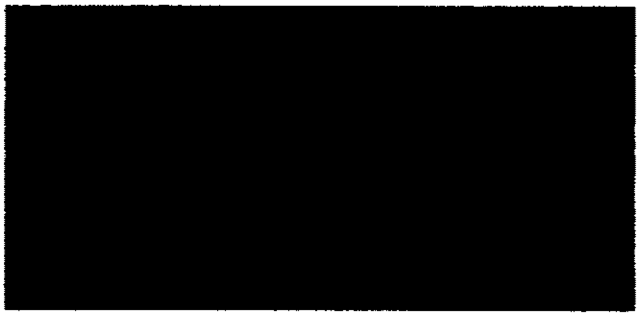

Figure 5.9 File ID:3686

5.3.2 Selar Boops

Table 5.2 : Selar Boops File ID

File ID	Pixel	
	x	y
3195	209	495
	219	499
	222	496
	250	498
	276	499
	285	499
	278	500
	290	500
3196	334	558
	335	558
	409	567
	430	558
	431	558
	486	563
	530	555

Processing the data above, one software had been develop based on the pixel location of the ping. The result are as figured below.

Figure 5.10: File ID:3195

Figure 5.11: File ID:3196.

The images above used in processed to get the average color of each pixel. Through the software development by image processing technique , the average of RGB are obtained.

Table 5.3 : Decapterus Meruadsi and Selar Boops with the average RGB from the software development by MATLAB

FILE ID	TOTAL DATA	AVERAGE		
		R	G	B
3684	5	67.75	138.375	130.750
3685	4	0	25.6	226.4
3686	7	6	142	74
3195	8	43	126	128
3196	5	43	126	128

5.4 Feature Extraction

To represent the identification of either Decapterus Meruadsi or Selar Boops , this method used to process some feature from the both types of the fish.

5.4.1 Mean RGB

From the average , the new range obtained used to identify the type of fish either Decapterus Meruadsi or Selar Boops.

The average RGB plot in bar graph below to view the differences between the data processed. The analysis of the error are discussed in subchapter 5.6 Analysis of data. Figure 5.9 and Figure 5.10 show the plotted bar for File ID 3684 ,File ID 3685 and File ID 3686 and File ID 3195 and File ID 3196 respectively.

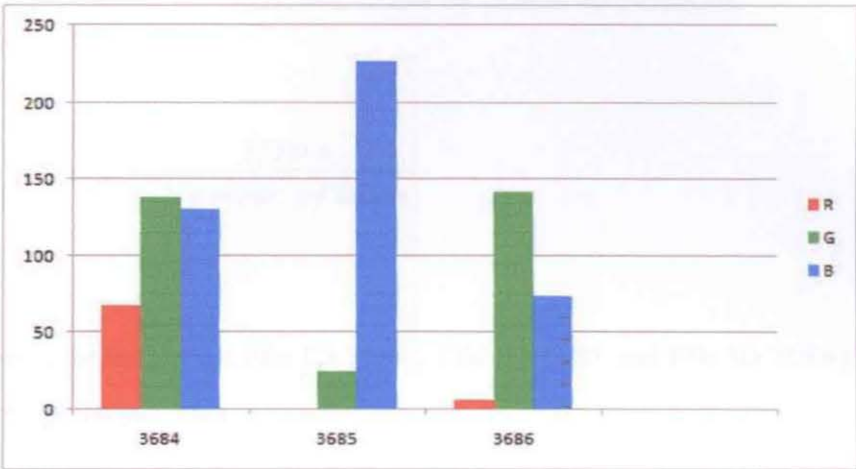

Figure 5.12: Plotted bar for File ID 3684 , File ID 3685 and File ID 3686.

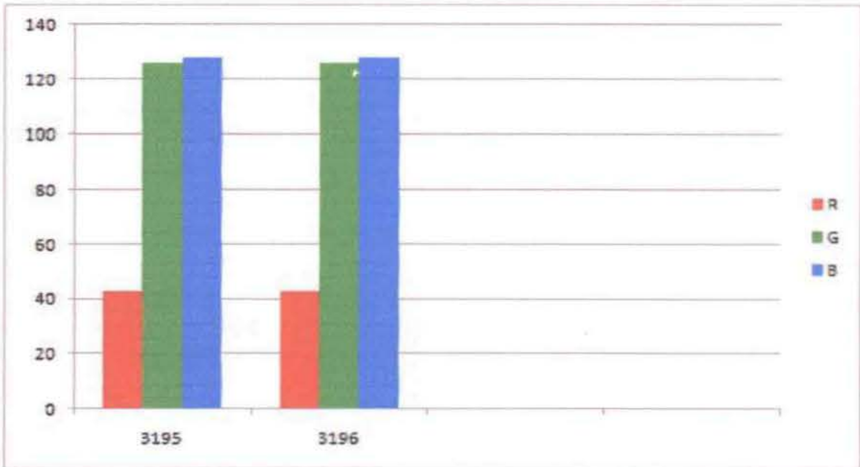

Figure 5.13: Plotted bar for File ID 3I95 and File ID 3196

The new range of RGB are calculated below by simple mathematics.

$$\text{Average R or G or B}=\frac{\sum \text{Data}}{\textit{Number of Data}} \quad ...(1)$$

RGB average calculation for File ID 3684 , File ID 3685 and File ID 3686 (Decapterus Meruadsi) are show below.

$$R=\frac{0.6+0.75+6.0}{3}=2.45 \quad ...(2)$$

$$G=\frac{27+12.23+142}{3}=60.4 \quad ...(3)$$

$$B=\frac{135.4+223+128}{3}=144 \quad ...(4)$$

RGB average calculation for File ID 3195 and File ID 3196 (Selar Boops)

$$R = \frac{43 + 43}{2} = 43 \quad ...(5)$$

$$G = \frac{126 + 126}{2} = 126 \quad ...(6)$$

$$B = \frac{128 + 128}{2} = 128 \quad ...(7)$$

The results from the RGB average calculation use to set the new colour threshold that used to develop the software to identify the type of fish.The colour threshold are shown below.

Table 5.4 : Decapterus Meruadsi and Selar Boops average threshold

Type of Fish	R	G	B
Decapterus Meruadsi	2.45	60.4	144
Selar Boops	43	126	128

Hence , the range is set in concern of the color accuracy which are about 99%-100% to the real color.

Table 5.5 : Decapterus Meruadsi and Selar Boops range of threshold

Type of Fish	Digital Image Representation

	R	G	B
Decapterus Meruadsi	2-4	59-60	143-144
Selar Boops	42-43	125-126	127-128

5.4.2 The differences of RGB

A. Decapterus Meruadsi

Table 5.6 : Decapterus Meruadsi File ID with the average of RGB respectively.

File ID / RGB	File ID 3684	File ID 3685	File ID 3686
R	**0.6**	**0.75**	**6.0**
G	**27.0**	**12.2**	**142**
B	**135.4**	**223**	**74**

B. Selar Boops

Table 5.7 : Selar Boops File ID with the average of RGB respectively.

File ID / RGB	File ID 3195	File ID 3196
R	**43**	**43**
G	**126**	**126**
B	**128**	**128**

5.4.3 Pixel area

The total number of pixel from Decapterus Meruadsi and Selar Boops is are calculated. This process done by using *bwarea*. This syntax done for the in binary image. The result from this process will used in decision stage.

Table 5.8 : Pixel area values

File ID	Pixel Area values	
	Decapterus Meruadsi	**Selar Boops**
3684	1	0
3685	20.3750	5
3686	13	5
3195	0	5.7266×10^4

3196	0	41199

5.5 Decision

By comparing calculated the pixel values in echogram image for both types of fish , it can differentiate between Decapterus Meruadsi and Selar Boops.

By the using algorithm below, both types of fish are identified.

If Area=Decapterus Meruadsi > Selar Boops

Then image is Decapterus Meruadsi

else

Table5.9 :Decision for identification for both types of fish.

File ID	Pixel Area values		Decision from MATLAB	
	Decapterus Meruadsi	Selar Boops	Decapterus Meruadsi	Selar Boops
3684	1	0	√	
3685	20.3750	5	√	
3686	13	5	√	

3195	0	5.7266 x10^4		√
3196	0	41199		√

Table5.10 : Comparing the output identification with the original File ID.

File ID	**Original File ID**	**Pixel Area values**		**Decision from MATLAB**	
	Fish Type	**Decapterus Meruadsi**	**Selar Boops**	**Decapterus Meruadsi**	**Selar Boops**
3684	Decapterus Meruadsi	1	0	√	
3685	Decapterus Meruadsi	20.3750	5	√	
3686	Decapterus Meruadsi	13	5	√	
3195	Selar Boops	0	5.7266 x10^4		√
3196	Selar Boops	0	41199		√

This result used to develop the Graphic User Interface (GUI) for fish identification. Which allow the the user can choose the type of fish by choosing the image file from in echogram presentation.Figure 5.13 – Figure 5.13 show how the GUI works.

Figure 5.14 : Image show the GUI without any File ID loaded.

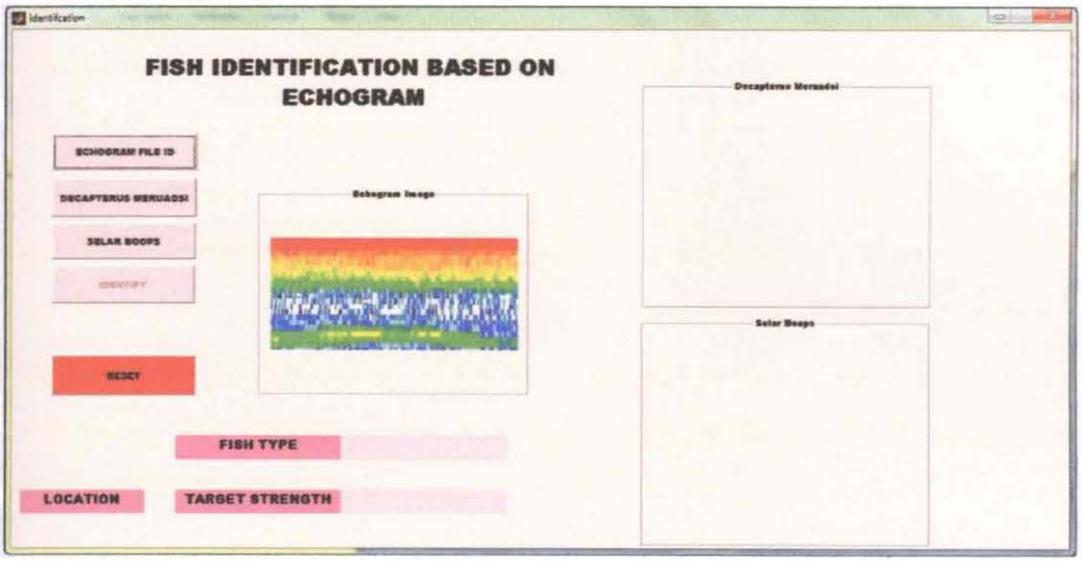

Figure 5.15 : Image show the GUI showing the image when the File ID is selected.

Lastly , the GUI will show the image of the result of identification. This GUI allow the researcher to load the image of the echogram and do the identification of two types of fish.

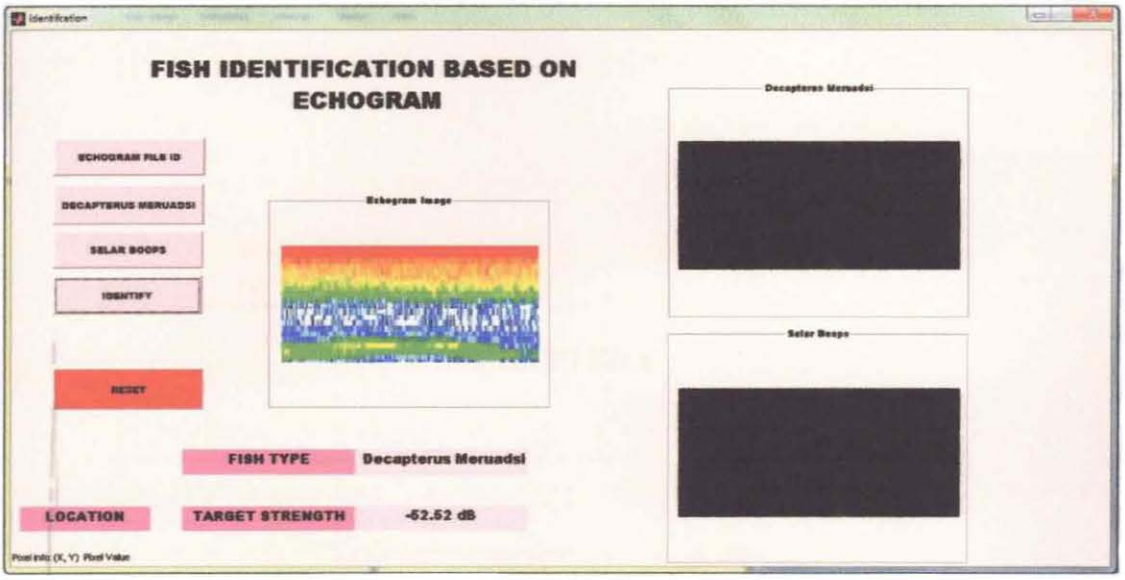

Figure 5.16 :.File ID show File ID 3684 , by both identification .

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

In developing a system on image processing for identifying the species of fish. The data from echogram in image presentation with '.png ' format is successfully created.

Threshold technique was implemented to compare the Target Strength between two or more species of fish hence, distinguish the species of fish by pattern recognition or identification .Decapterus Meruadsi is identify by the threshold of RGB , 2-4 , 59-60 , 143-144 , respectively. While, Selar Boops is identify by threshold values of RGB , 42-43 ,125-126 and 127-128 respectively.

Besides , the method by choosing the desired pixel is applicable to get the accurate range.Finally the Graphical User Interface is successfully developed to help the fisheries doing the research by using the presentation of echogram.

6.2 Limitation & Future Development

During completing this project , few problems discovered

I. The color indicator for actual TS is not very accurate in RGB representation.

II. There were too many noise in echogram representation due the occurrence of the other object exist during the measurement done.

In the future, there are a few things that can be fixed or added in order to improve this system such as by getting the exact location of the fish by using the acquiring data from updated software providing the accurate echogram.

6.3 Costing

This project only requires of software and the small material of hardware is digital camera. The license of Matrix Laboratory (MATLAB) is required to activate this software. However, there is free trial version on MATLAB available as an alternative for the user.

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Appendix A

```
clc
clear all
dataSelayang=imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapan_empat.png');
b=dataSelayang;
figure(1),imshow(dataSelayang)
[r c d]=size(dataSelayang);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==67 && loop2==26
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==100 && loop2==29
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==69 && loop2==77
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==94 && loop2==101
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==96 && loop2==180
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);

            else
                dataSelayang(loop1,loop2,loop3)=0;
            end
        end
    end
end
figure(2),imshow(dataSelayang)
impixelinfo;
red=dataSelayang(:,:,1);
green=dataSelayang(:,:,2);
blue=dataSelayang(:,:,3);
average_red=sum(sum(red))/5;
average_green=sum(sum(green))/5;
average_blue=sum(sum(blue))/5;
```

Software development for File ID 3584 , Decapterus Meruasi for finding average of RGB

```
clc
clear all
a=imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapan_lima.png');
b=a;
figure(1),imshow(a)
[r c d]=size(a);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==100 && loop2==17
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==100 && loop2==18
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==100 && loop2==21
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==94 && loop2==95
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);


            else
                a(loop1,loop2,loop3)=0;
            end
        end
    end
end
figure(2),imshow(a)
impixelinfo;
red=a(:,:,1);
green=a(:,:,2);
blue=a(:,:,3);
average_red=sum(sum(red))/4;
average_green=sum(sum(green))/4;
average_blue=sum(sum(blue))/4;
```

Software development for File ID 3585 , Decapterus Meruasi for finding average of RGB

```
dataSelayang=imread('C:\Users\win7\Documents\MATLAB\tiga_enam_lapanenam.jpg');
b=dataSelayang;
figure(1),imshow(dataSelayang)
[r c d]=size(dataSelayang);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==101 && loop2==7
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==102 && loop2==9
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
             elseif loop1==97 && loop2==13
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==100 && loop2==45
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==106 && loop2==53
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==106 && loop2==57
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==92 && loop2==72
            dataSelayang(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            else
                dataSelayang(loop1,loop2,loop3)=0;
            end
        end
    end
end
figure(2),imshow(dataSelayang)
impixelinfo;
red=dataSelayang(:,:,1);
green=dataSelayang(:,:,2);
blue=dataSelayang(:,:,3);
average_red=sum(sum(red))/7;
average_green=sum(sum(green))/7;
```

Software development for File ID 3586 , Decapterus Meruasi for finding average of RGB

```
a=imread('C:\Users\win7\Documents\MATLAB\tiga_satu_sembilan_lima.png');
b=a;
figure(1),imshow(a)
[r c d]=size(a);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==495 && loop2==209
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==499 && loop2==219
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==496 && loop2==222
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==495 && loop2==250
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==499 && loop2==276
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==499 && loop2==285
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==500 && loop2==278
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==500 && loop2==290
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            else
                a(loop1,loop2,loop3)=0;
            end
        end
    end
end
figure(2),imshow(a)
impixelinfo;
red=a(:,:,1);
green=a(:,:,2);
blue=a(:,:,3);
average_red=sum(sum(red))/8;
```

Software development for File ID 3195 , Selar Boops for finding average of RGB

```
clc
clear all
a=imread('C:\Users\win7\Documents\MATLAB\tiga_satu_sembilan_enam.png');
b=a;
figure(1),imshow(a)
[r c d]=size(a);
for loop1=1:r
    for loop2=1:c
        for loop3=1:3
            if loop1==558 && loop2==334
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==567 && loop2==409
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==558 && loop2==430
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==563 && loop2==486
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            elseif loop1==555 && loop2==530
            a(loop1,loop2,loop3)=b(loop1,loop2,loop3);
            else
                a(loop1,loop2,loop3)=0;
            end
        end
    end
end
figure(2),imshow(a)
impixelinfo;
red=a(:,:,1);
green=a(:,:,2);
blue=a(:,:,3);
average_red=sum(sum(red))/5;
average_green=sum(sum(green))/5;
average_blue=sum(sum(blue))/5;
```

ꞩoftware development for File ID 3196 , Selar Boops for finding average of RGB

```
dataIkan= imread('[illegible]MATLAB\tiga enam_lapan_lapan.png');
figure(1), imshow (dataIkan)
red=dataIkan(:,:,1);
green=dataIkan(:,:,2);
blue=dataIkan(:,:,3);
dataIkan_gray=rgb2gray(dataIkan);
[illegible]
[illegible]
[r c]=size(dataIkan_gray);
for loop1=1:r
    for loop2=1:c
        if  red(loop1,loop2)>3||red(loop1,loop2)<2||...
            green(loop1,loop2)>60||green(loop1,loop2)59||...
            blue(loop1,loop2)>144||blue(loop1,loop2)<143;
            dataIkan(loop1,loop2,:)=0;


        end
    end
end

figure(2), imshow (dataIkan) , title ('Ikan Selayang');
impixelinfo;
```

Software development for Decapterus Meruadsi identification

```
dataIkan= imread('[illegible]MATLAB\tiga_satu_sembilan_lima.png');
figure(1), imshow (dataIkan)
impixelinfo;
red=dataIkan(:,:,1);
green=dataIkan(:,:,2);
blue=dataIkan(:,:,3);
dataIkan_gray=rgb2gray(dataIkan);
[r c]=size(dataIkan_gray);
for loop1=1:r
    for loop2=1:c
        if  red(loop1,loop2)>43||red(loop1,loop2)<42||...
            green(loop1,loop2)>126||green(loop1,loop2)<12||...
            blue(loop1,loop2)>128 ||blue(loop1,loop2)<127);
            dataIkan(loop1,loop2,:)=0;


        end
    end
end

figure(2), imshow (dataIkan) , title ('Ikan Selar');
impixelinfo;
```

Software development for Selar Boops identification

```
function varargout = identifcation(varargin)
  IDENTIFCATION M-file for identifcation.fig
        IDENTIFCATION, by itself, creates a new IDENTIFCATION or raises the
existing
        singleton*.

        H = IDENTIFCATION returns the handle to a new IDENTIFCATION or the
handle to
        the existing singleton*.

        IDENTIFCATION('CALLBACK',hObject,eventData,handles,...) calls the
local
        function named CALLBACK in IDENTIFCATION.M with the given input
arguments.

        IDENTIFCATION('Property','Value',...) creates a new IDENTIFCATION or
raises the
        existing singleton*.  Starting from the left, property value pairs are
        applied to the GUI before identifcation_OpeningFcn gets called.  An
        unrecognized property name or invalid value makes property application
        stop.  All inputs are passed to identifcation_OpeningFcn via varargin.

        *See GUI Options on GUIDE's Tools menu.  Choose "GUI allows only one
        instance to run (singleton)".

  See also: GUIDE, GUIDATA, GUIHANDLES

  Edit the above text to modify the response to help identifcation

  Last Modified by GUIDE v2.5 [illegible]

  Begin initialization code - DO NOT EDIT
gui_Singleton = 1;
gui_State = struct('gui_Name',       mfilename, ...
                   'gui_Singleton',  gui_Singleton, ...
                   'gui_OpeningFcn', @identifcation_OpeningFcn, ...
                   'gui_OutputFcn',  @identifcation_OutputFcn, ...
                   'gui_LayoutFcn',  [] , ...
                   'gui_Callback',   []);
if nargin && ischar(varargin{1})
    gui_State.gui_Callback = str2func(varargin{1});
end

if nargout
    [varargout{1:nargout}] = gui_mainfcn(gui_State, varargin{:});
else
    gui_mainfcn(gui_State, varargin{:});
end
  End initialization code - DO NOT EDIT


  --- Executes just before identifcation is made visible.
```

```
function identifcation_OpeningFcn(hObject, eventdata, handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
% varargin   command line arguments to identifcation (see VARARGIN)

% Choose default command line output for identifcation

set(handles.axes1,'visible','off');
set(handles.axes2,'visible','off');
set(handles.axes3,'visible','off');
handles.output = hObject;

% Update handles structure
guidata(hObject, handles);

% UIWAIT makes identifcation wait for user response (see UIRESUME)
% uiwait(handles.figure1);


% --- Outputs from this function are returned to the command line.
function varargout = identifcation_OutputFcn(hObject, eventdata, handles)
% varargout  cell array for returning output args (see VARARGOUT);
% hObject    handle to figure
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure
varargout{1} = handles.output;


% --- Executes on button press in FILE.
function FILE_Callback(hObject, eventdata, handles)
% hObject    handle to FILE (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
set (handles.SELAYANG,'enable', 'off');
set (handles.SELAR,'enable', 'off');
set (handles.IDENTIFY,'enable', 'off');
[FileName,PathName] =uigetfile({'*.png'}, 'Load Image File');


if (FileName==0)
    return;
end

handles.fullPath= [PathName FileName] ;
ori_image =imread (handles.fullPath);
handles.ori_image= ori_image;
axes (handles.axes1); imshow (ori_image);
handles.image1 = ori_image;
handles.image2 = ori_image;
```

```
% set (handles.LOAD,'enable', 'off');
set (handles.SELAYANG,'enable', 'on');
set (handles.SELAR,'enable', 'on');
guidata(hObject, handles);


% --- Executes on button press in SELAYANG.
function SELAYANG_Callback(hObject, eventdata, handles)
% hObject    handle to SELAYANG (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
red=handles.image1(:,:,1);
green=handles.image1(:,:,2);
blue=handles.image1(:,:,3);
dataIkan_gray=rgb2gray(handles.image1);
axes(handles.axes2); imshow (dataIkan_gray);
%figure(2),imshow (a_gray);
%filter to remove other color
[r c]=size(dataIkan_gray);
for loop1=1:r
    for loop2=1:c
        if  red(loop1,loop2)>3||red(loop1,loop2)<2||...
            green(loop1,loop2)>60||green(loop1,loop2)59||...
            blue(loop1,loop2)>144||blue(loop1,loop2)<143;
            handles.image1(loop1,loop2,:)=0;


        end
    end
end


axes(handles.axes2); imshow (handles.image1) ;



% binary image
BW=im2bw (handles.image1 ,0.1);
axes(handles.axes2); imshow (BW) ;
impixelinfo;
guidata(hObject, handles);


% --- Executes on button press in SELAR.
function SELAR_Callback(hObject, eventdata, handles)
% hObject    handle to SELAR (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
red=handles.image2(:,:,1);
green=handles.image2(:,:,2);
blue=handles.image2(:,:,3);
dataIkan_gray=rgb2gray(handles.image2);
axes(handles.axes3); imshow (dataIkan_gray);
```

```
%filter to remove other color
[r c]=size(dataIkan_gray);
for loop1=1:r
    for loop2=1:c
        if  red(loop1,loop2)>43||red(loop1,loop2)<42||...
            green(loop1,loop2)>126||green(loop1,loop2)<12||...
            blue(loop1,loop2)>128||blue(loop1,loop2)<127;
            handles.image2(loop1,loop2,:)=0;


        end
    end
end

axes(handles.axes3); imshow (handles.image2);
impixelinfo;
%binary image
BW2=im2bw (handles.image2 ,0.1);
axes(handles.axes3); imshow (BW2) ;
impixelinfo;
set (handles.IDENTIFY,'enable', 'on');
guidata(hObject, handles);



% --- Executes on button press in RESET.
function RESET_Callback(hObject, eventdata, handles)
% hObject    handle to RESET (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)

cla(handles.axes1);
set(handles.axes1,'visible','off');
cla(handles.axes2);
set(handles.axes2,'visible','off');
cla(handles.axes3);
set(handles.axes3,'visible','off');
set(handles.text1,'visible','on');
set(handles.text2,'string','');
set(handles.text3,'visible','on');
set(handles.text4,'string','');
set (handles.SELAYANG,'enable', 'off');
set (handles.SELAR,'enable', 'off');
set (handles.IDENTIFY,'enable', 'off');
guidata(hObject, handles);
clear all
clc


% --- Executes on button press in IDENTIFY.
function IDENTIFY_Callback(hObject, eventdata, handles)
% hObject    handle to IDENTIFY (see GCBO)
% eventdata  reserved - to be defined in a future version of MATLAB
% handles    structure with handles and user data (see GUIDATA)
```

```
%total area 1
BW=im2bw (handles.image1 ,0.1);
%axes(handles.axes2); imshow (BW) ;
handles.area1=bwarea(BW)


%total area 2
BW2=im2bw (handles.image2 ,0.1);
%axes(handles.axes3); imshow (BW2) ;
handles.area2=bwarea(BW2)


if handles.area1 >= handles.area2
    set (handles.text2 , 'string' , ' Decapterus Meruadsi');
    set (handles.text4 , 'string','-52.52 dB');
else
    set (handles.text2 , 'string' , 'Selar Boops');
    set (handles.text4 , 'string','-46.97 dB');
end


guidata(hObject, handles);
```