

## CHAPTER I. INTRODUCTION

### 1.1 Background

Indonesia is a country with very high potential marine resources. This high potential of marine resources is used as an economic support by the state, including the fisheries sector such as pelagic fish. One area that has pelagic fisheries potential is the waters of West Sumatra. According to Purbani et al (2016), West Sumatra has potential resources for large pelagic fish, including skipjack, mackerel, tuna, and narrow bared mackerel, based on habitat characteristics or fish habitat.

Pelagic fish are organisms that have the ability to move so that they are not dependent on ocean currents or water movements caused by wind. Pelagic fish are fish that live in the surface layer of water to the *middle layer*. In areas where there is *anupwelling* process, this resource can form a very large biomass. Pelagic fish generally live in groups of both their own and other types of fish but there is a tendency for pelagic fish to cluster based on their size group (Susilo, 2011). There are two types of pelagic fish resources, namely large pelagic fish and small pelagic fish. One of the differences between the two types of fish is that large pelagic fish are oceanic, while small pelagic fish are neritic (Marine Fisheries Research Center, 2014). In Indonesia, there are four types of tuna (neritic tuna) managed in the TCT Fisheries Management Plan (FMP) consisting of bullet tuna (*Auxis rochei*), frigate tuna (*Auxis thazard*), mackerel tuna (*Euthynnus affinis*) and longtail tuna (*Thunnus tonggol*) (KKP, 2015).

Frigate tuna (*Auxis thazard* Lacepède, 1800) is a large pelagic fish species that is always migratory and lives in groups. This fish has a distribution area in

epipelagic, neritic and oceanic waters (Collete and Nauen, 1983). Frigate tuna is a fish that plays an important role in the fishing industry in Indonesia. Along with the high demand for frigate tuna, the catch of this fish continues to increase. According to Hartaty and Setyadji (2017), the exploitation of frigate tuna continues to increase every year with a variety of fishing gear (gill nets, purse seines and huhate). It is known that more than 90% of frigate tuna fishing is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%) (IOTC, 2014). So it can be illustrated that frigate tuna is a fish that plays an important role for fisheries in Indonesia, especially in West Sumatra waters.

Overfishing without considering the condition of the fish, such as the stage of gonad maturity, can cause a decrease in the quality and quantity of fish resources (Abubakar et al., 2019). This will affect catches and can cause fish distribution to decrease if fishers do not pay attention to the sustainability of fish resources (Heino and Godo, 2002). Reduced fish populations in the long term can be caused by the catch of fish that are about to spawn or have never spawned (Katiandagho and Marasabessy, 2017). Therefore, it is important to know the development of fish populations through Gonadal Somatic Index (GSI) and understand fecundity to determine the number of fish to be produced and the number of fish in certain age classes (Pamungkas et al., 2014; Flores et al., 2019).

Research on the reproductive biology of frigate tuna is still limited. Several studies related to the reproductive biology of frigate tuna (*A. thazard*) have been conducted by Muthiah (1985), who studied the fecundity of frigate tuna in Indian waters, Calicdan-Villarao et al. (2017) examined the biology and population dynamics in Philippine waters, Arnenda et al. (2022) examined several aspects of

reproductive biology in Sibolga waters. Herath et al. (2019) studied biological aspects and molecular variations of frigate tuna in Sri Lankan waters. Purwaningsih et al. (2022) examined aspects of frigate tuna reproductive biology in Bali Waters. Vieira et al. (2022) examined age, growth and maturity in Brazilian waters. However, there is still not much research on the reproductive biology of frigate tuna in West Sumatra waters.

The existence of fish in a body of water is strongly influenced by oceanographic conditions in the area. According to Sastra et al. (2018) oceanographic parameters in the form of sea surface temperature (SST) greatly affect the catch of fish in a body of water. The sea surface temperature factor greatly determines the activity of metabolic development of organisms in the sea (Gani et al., 2021). A certain temperature range in a body of water can affect the distribution of fish in those waters (Tangke et al., 2015). In addition to sea surface temperature, there are other oceanographic parameters that can determine information on fishing grounds, namely chlorophyll-a. According to Adnan (2010), chlorophyll-a can absorb blue and green light because of this ability the presence of phytoplankton can be detected. Both phytoplankton and zooplankton have an important role in the marine ecosystem because plankton are food for various other types of marine animals. Both oceanographic parameters can be detected using remote sensing methods or satellite imagery.

There has not been much research on the reproductive biology of frigate tuna in West Sumatra waters. Therefore, this research needs to be done to add data and support information about the reproductive biology of frigate tuna in West Sumatra waters. So that this research can be used as a benchmark and reference in

managing the resources and availability of frigate tuna and pave the way for other researchers to conduct sustainable research.

### **1.2 Problem Formulation**

1. What are the growth patterns and condition factor of frigate tuna (*Auxis thazard*) caught by fishermen in West Sumatra waters?
2. How is the reproductive biology of frigate tuna (*Auxis thazard*), which includes Sex Ratio, Gonad Maturity Level (GML), Gonad Maturity Index (GMI), and Fecundity caught by fishermen in West Sumatra waters?

### **1.3 Research Objectives**

1. Knowing the growth patterns and condition factor of frigate tuna (*Auxis thazard*) caught by fishermen in West Sumatra waters.
2. Knowing the reproductive biology of frigate tuna (*Auxis thazard*) which includes Sex Ratio, Gonad Maturity Level (GML), Gonad Maturity Index (GMI), and Fecundity of fishermen caught in West Sumatra waters.

### **1.4 Research Benefits**

This research is useful to support information on frigate tuna stocks and their reproductive biology, assist the government in supporting data that can be used as a reference for developing, policies, and managing marine fisheries resources and additional information for the community.

