

# The Study of Environmental Parameters and Their Effect on Squid (*Loligo* sp) In Waters of Padang City

D P Wulandari<sup>1</sup>, E Kamal<sup>2\*</sup>

<sup>1</sup>Postgraduate Program, Aquatic, Coastal and Marine Resource, Bung Hatta University

<sup>2</sup>College teacher Program of Aquatic, Coastal, and Marine Resource, Postgraduate Bung Hatta University

\*Corresponding author's email: [ekamal898@bunghatta.ac.id](mailto:ekamal898@bunghatta.ac.id)

---

## ABSTRACT.

The squid is one of the fishery resources which has a large economic value in the City of Padang. The fishing season and conditions of the water environment effect of squid capture activity. The fishing activity of squid on a large scale can disturb the water environment and reduced squid stocks in the Waters of Padang City. In this study the quantitative and descriptive method was used. Ecology factor such as temperature, salinity, weather, and current influences growth pattern of the squid. The peak season for catching squid occurs in the second intern monsoon (September, October, November) with an average temperature value (28°C - 30°C). Squids have the ability to adapt to low and high salinity. The range of salinity values for squid caught in coastal waters is between (29-31‰), coastal areas (32-34‰), and salinity for the open sea is (33-37‰). Water environmental conditions that have high temperatures affect the spawning process of squid besides the weather, and relatively supportive sea wave conditions also affect the catch of squid. Based on the CPUE which has been analyzed from the years (2008-2017) squid has decreased every year.

**Keyword:** Catch, Environmental parameter, Squid

## 1. Introduction

Squid (*Loligo* sp) belongs to the family of Cephalopods that live throughout the waters near the coast or around the islands. Squid is a sea mollusk with the widest distribution area. The distribution of squid fishery resources is almost in all Indonesian waters, especially in the waters of Padang City, West Sumatra Province. In the coastal region of Asia Squid is one of the fishery resources of high economic value. Its distribution areas include the East China Sea, the South China Sea, the Gulf of Thailand, the Arafura Sea, the Timor Sea, and Australian waters, Pacific-West Waters, and the Indonesia [1]. Environmental condition in waters of Padang City influences capture activity of squid. Squid is one of the fishery resources that always migration.

Environmental parameters such as temperature, salinity, rainfall, and climate change also effect the spread of squid catches [2]. Condition environmental of waters or ecosystem cause to rapid growth in the squid. Alternatives to obtain effective catching results is to know the pattern of the squid catching season in Padang city waters. So that squid catching activities can run well. The continuity between environmental parameters and the pattern of the squid catching season is important for fishermen in Padang City.

## 2. Material and Methods

### 2.1. Flow Diagram

This flow chart is needed to simplify the analysis process. The flow diagram can be seen in Figure 1.

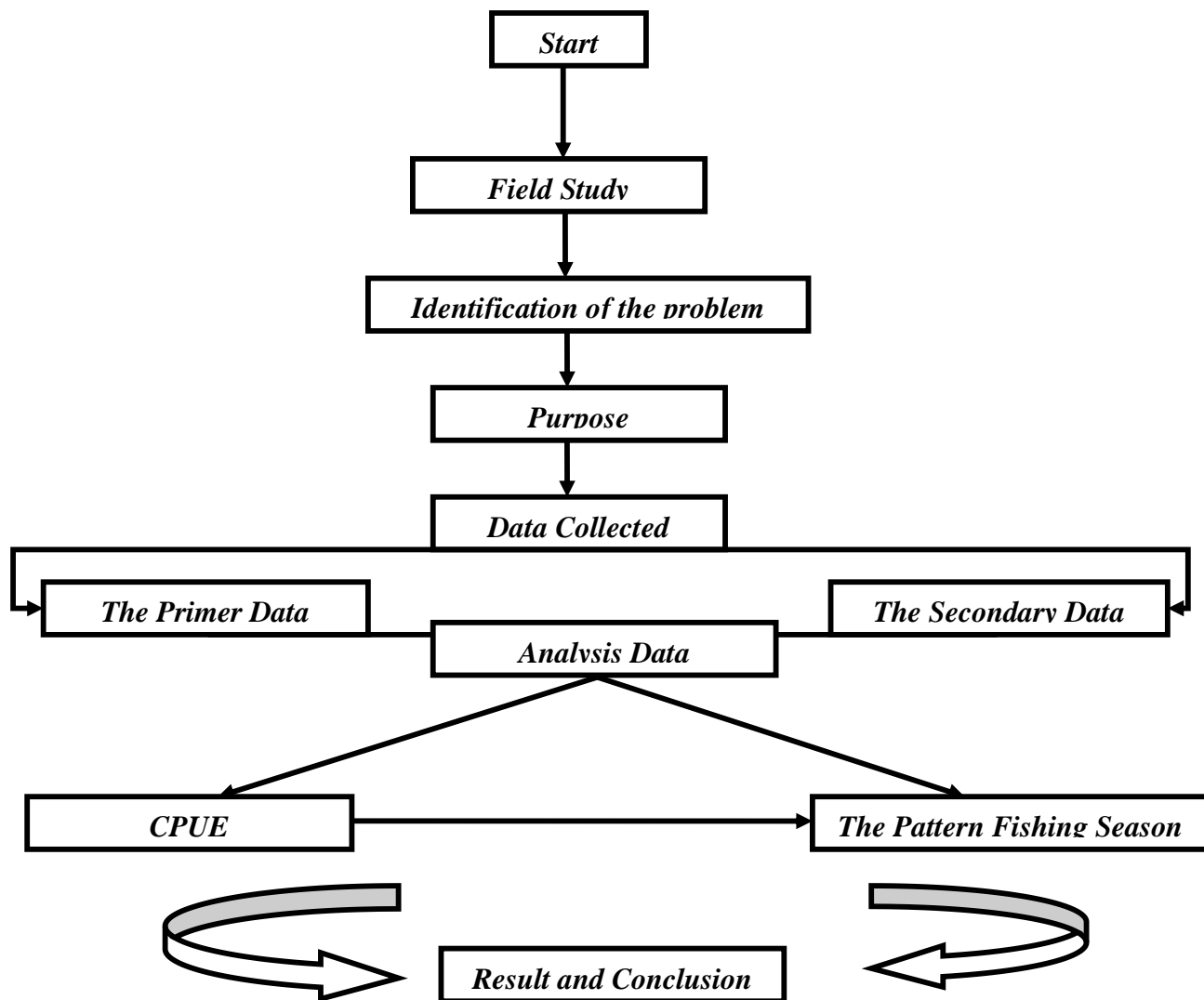


Figure. 1. Flow Chart Research

2.2. Objectives and studysite

The purpose of this study was to analyze the relationship of environmental parameters to squid catches, and analyze the pattern of a squid catching season in the waters of Padang City. This research was conducted in The Waters of Padang City, West Sumatra Province in November 2020.

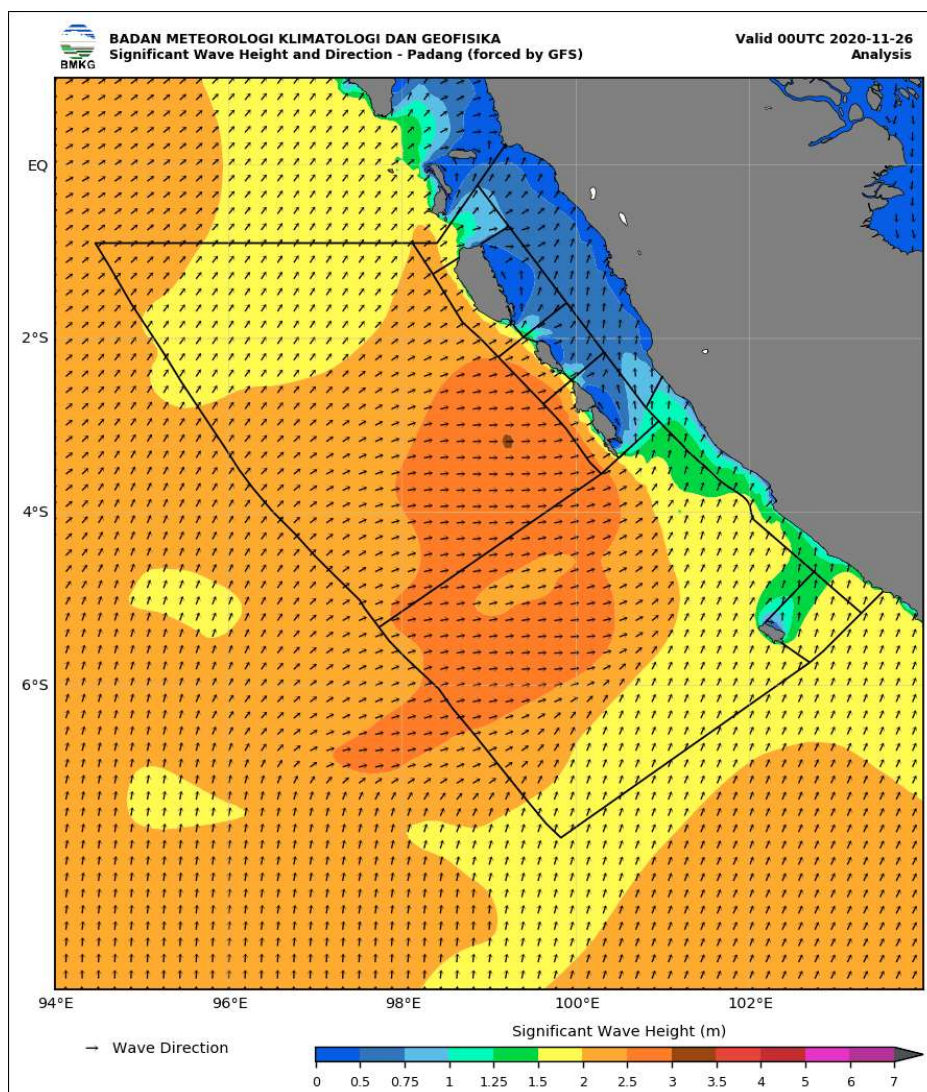


Figure. 2. The Waters in Padang City

2.3. *Research Methods*

The method used is a descriptive method by analyzing data and focusing on a case study of CPUE value, squid catching season index value, and environmental parameters of squid ecosystem distribution in Padang city waters. The descriptive method is a method used in researching the status, a group of people, a condition, an object, or events in the present that aims to get a systematic picture of the phenomenon investigated.

2.4. *Data Collected*

The data collected during the analysis of the relationship of environmental parameters to squid catches are secondary data and primary data. The secondary data was obtained from the data "Statistics of the Fisheries Office of West Sumatra Province". While the primary data is the data obtained directly from interviews with fishermen about the squid catching season in Padang city

waters. Data on environmental parameters such as temperature, salinity, sea depth, and rainfall are used data from the BMKG and Nasa Ocean.

## 2.5. Analysis Data

Primary data and secondary data that have been obtained are then analyzed descriptive. The purpose of the data analysis is to illustrate the influence of environmental parameters on squid catches in the Waters of Padang City, West Sumatera Province.

### 2.4.1. Catch Per Unit Effort (CPUE)

Catch Per Unit Effort is generally used as an index estimating the relative abundance of a population. These indices are applied in fishery management of fishery resource stocks so as to maintain the aquatic environment and catch can be effective [3]. CPUE is a method used to determine the amount of marine fishery production that is averaged in the annual

Equation (4) of nominal CPUE can be written as;

$$CPUE = \frac{Catch}{Effort}$$

Where is CPUE is nominal CPUE in a year, Catch is the total catch production of squid, and Effort is the total days fished in a year.

### 2.4.2. The pattern of the fishing season

To obtain an effective and efficient the catch of squid, an analysis is required in the pattern of the season of catching squid. The catch season pattern is useful for maximizing catches in a waterway. Environmental conditions around the fishing area influences pattern season of the capture fishery. The Calculation of the formula of the capture season pattern using a simple regression method.

The Equation of a nominal Fishing Season Index can be written as;

$$The\ Fishing\ Season\ Index = \frac{Catch\ average}{Production\ of\ capture}$$

Fishing season can be categorized in three categorized based on the value of (FSI) namely low catch season, moderate season, and the peak season (Table 1.)

**Table 1.** Fishing Season Categorized (FSI)

No.	The Value of (FSI)	Season Category
1.	<50%	Low catch
2.	50%≤IMP<100%	Moderate
3.	≥100%	Peak

### **3. Result**

For 10 years, it has been seen that squid fishery resources in Padang city water are endangered or have experienced exploitation of fishery resources. Squids are caught using a boat chart capture tool. In determining the catch per capture effort that becomes a reference for standardization is the number of catches and units of fishing equipment used. From 2008-2017 it appears that the CPUE value obtained each year has fluctuated. In 2017 CPUE in squid catches decreased by the amount due to the addition of chart capture equipment in the waters of Padang City. The productivity of fishery resources that have decreased significantly is the influence of the addition of capture efforts.

The difference in CPUE value obtained in each year is not a very significant difference in value (figure 3). The level of utilization and capture efforts that exceed the potential of existing fishery resources can threaten fishery resources in the long term [5]. Environmental waters condition influences the pattern of the squid in waters of Padang City and The CPUE value of squid that decreases every year.

The environmental condition of the waters and the pattern of the fishing season are determinants of the success of fishery activities for fishermen in the city of Padang. Based on the results of the calculation of the catch season index and the results of interviews with fishermen, the pattern of the fishing season in the waters of Padang City is divided into four fishing seasons. Which is a western season, the eastern season, the transitional season I, and transitional season II. The squid catching season index in Padang City Waters from 2008-2017 increased in 2012 and 2017 by 190% and 183% while for the lowest values in 2015-2016 it was 56% and 58% (figure 4).

The catch of a fishery resource can be abundant if it is in a supportive aquatic environment for the resource to live and colonize. One of the influences of the squid catching season is a good aquatic environment.

The environmental parameters that affect squid are the surface water temperature in the spawning area as well as the salinity of the waters in which it colonizes [6]. Squid in Padang City water can live at a temperature (28°C - 30°C) where at that temperature there is a change in the pattern of the catching season (Transitional Season II) in September, October, and November so that there is an abundance of squid catches in the Waters of Padang City (figure 5).

Water temperature conditions will affect both the spawning time of squid and the incubation period until hatching if it is at a relatively high temperature. While the pattern of catching the season that has decreased due to the temperature of squid waters is relatively low so that makes squid migrate to other places [7].

Besides, the increase of squid fishery resources in the second transitional season because is related to the occurrence of upwelling events to make the catch abundant [8]. As for the salinity of squid in Padang city water ranges (29-31‰). Squid can live tolerable in low or high salinity conditions as long as their habitat is not disturbed (Figure 6).

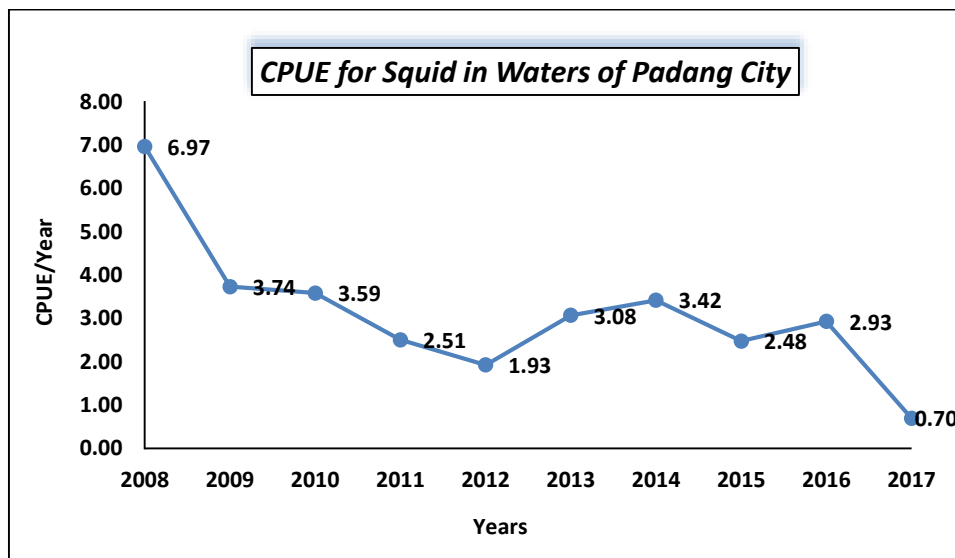


Figure 3. CPUE for Squid in Waters of Padang City (2008-2017)

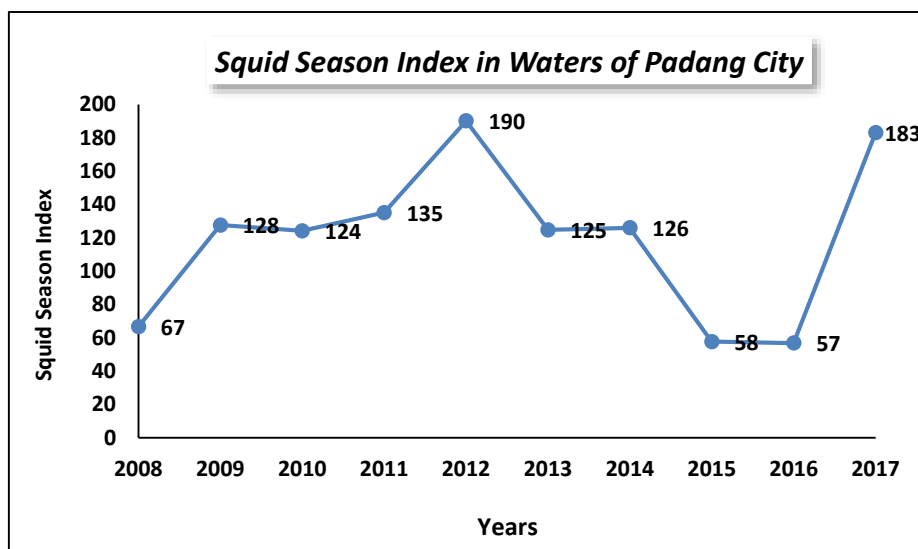
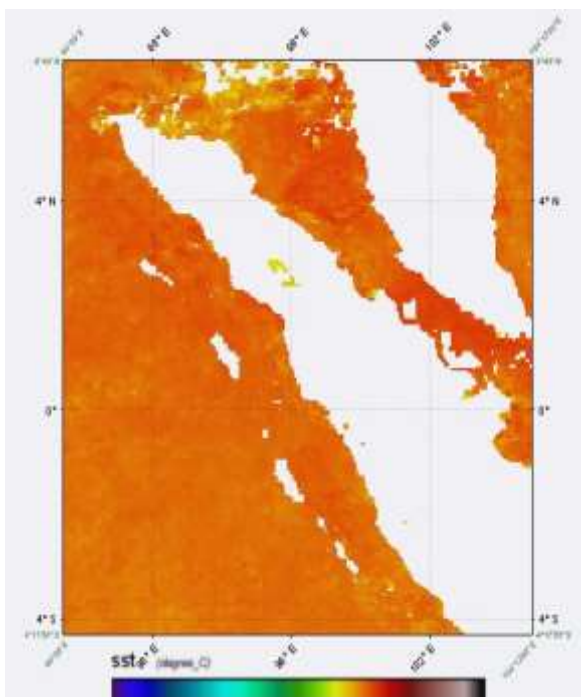
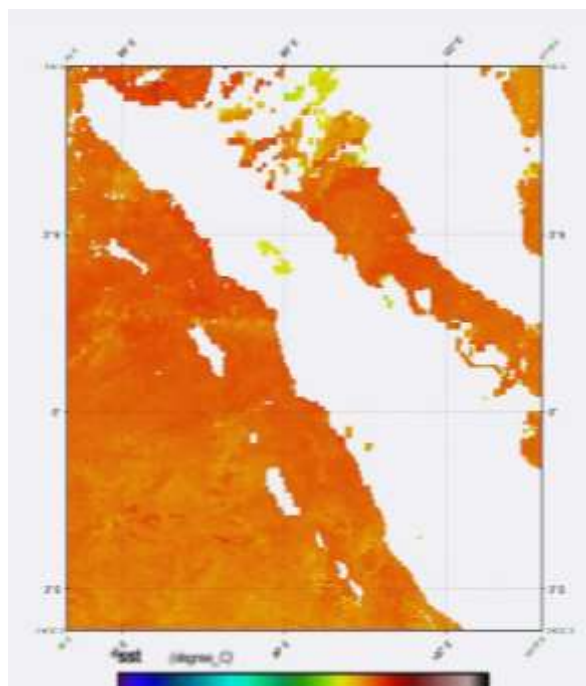


Figure 4. Squid Season Index in Waters of Padang City (2008-2017)

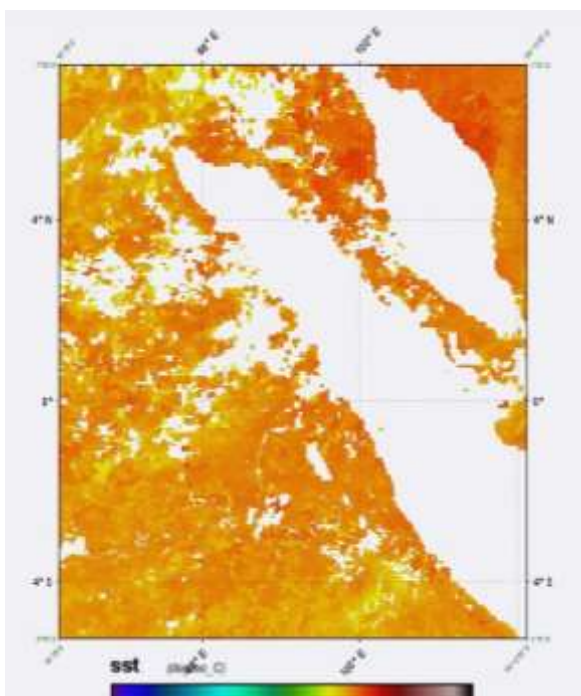




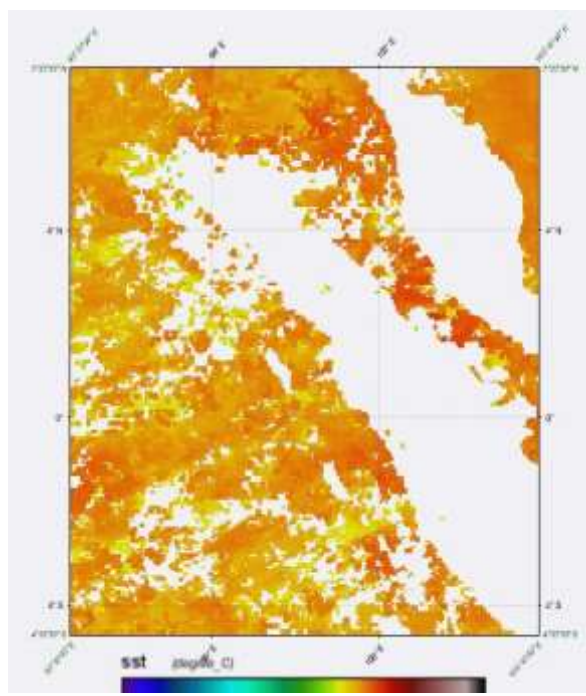
(a) July 2020



(b) August 2020



(c) September 2020



(d) October 2020

**Figure 5.** Sea Temperature

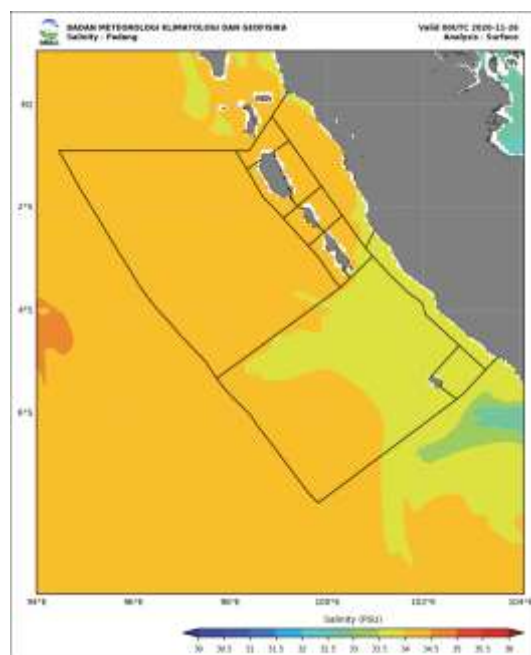


Figure 6. Salinity

#### 4. Conclusion

Squid in Padang city water in its spread and the abundance of catches are influenced by the capture season, environment, and CPUE. Abundant squid catches in Padang City Waters occur during Transitional Season II (September, October, November) which is influenced by relatively high temperatures around (28°C - 30°C) and salinity ranges (29-31‰). The relatively high surface temperature of the water affects the spawning process and a safe place for squid to live. While the catch season is relatively low due to the relatively low surface temperature of the water that makes squid migrate to high temperatures. The fishing season, as well as the environment that supports squid, catches in Padang City Waters are abundant, but when viewed from cpue value for 10 years (2008-2017) there is a decrease in CPUE value which means that squid in Padang City Waters has experienced overfishing conditions

#### Acknowledgement.

The author would like to thank my family. I am very grateful to head of program study who has always advised and supported me so that i can do this paper well, as well as friends from Postgraduate Program, Water Resources, Coastal and Marine, Bung Hatta University 2020. I hope the results of this study will be a guide and information for government and guidelines for futher research.

#### Reference

- [1] A. Febrianto, D. Simbolon, J. Haluan, and . Mustaruddin, "Pola Musim Penangkapan Cumi-Cumi Di Perairan Luar Dan Dalam Daerah Penambangan Timah Kabupaten Bangka Selatan (*Squid Fishing*



*Seasons Pattern Inside and Outside Waters of Tin Mining Area in South Bangka District*), 2017. *Mar. Fish. J. Mar. Fish. Technol. Manag.*, vol. 8, no. 1, p. 63, 2017.

- [2] Kurniawan, Suhandi, and N. U. Natiqoh, 2016. "Analisis Efektivitas Produksi Cumi-cumi ( *Loligo sp.* ) Pada Alat Tangkap Bagan Tancap Menggunakan Lampu Celup Dalam Air dan Lampu Di Atas Permukaan Air Di Desa Rebo Kab. Bangka," *J. Sumberd. Perair.*, vol. 10, no. 2, pp. 56–61.
- [3] D. Ghosh and J. Kumar Biswas, 2017. "Catch per unit efforts and impacts of gears on fish abundance in an oxbow lake ecosystem in Eastern India," *Environ. Heal. Eng. Manag.*, vol. 4, no. 3, pp. 169–175, 2017.
- [4] P. Sparre and S. C. Venema, 2001. "Introduction to tropical fish stock assessment. Pt. 1: Manual.- Pt. 2: Exercises," *Introduction to tropical fish stock assessment. Pt. 1: Manual.- Pt. 2: Exercises*, no. 306. pp. 1–2.
- [5] J. Wang, Y. Jiang, J. Zhang, X. Chen, and D. Kitazawa, 2020. "Catch per unit effort (CPUE) standardization of Argentine shortfin squid (*Illex argentinus*) in the Southwest Atlantic Ocean using a habitat-based model," *Int. J. Remote Sens.*, vol. 41, no. 24, pp. 9309–9327.
- [6] J. Wang, W. Yu, X. Chen, L. Lei, and Y. Chen, 2015. "Detection of potential fishing zones for neon flying squid based on remote-sensing data in the Northwest Pacific Ocean using an artificial neural network," *Int. J. Remote Sens.*, vol. 36, no. 13, pp. 3317–3330.
- [7] W. Wang, C. Zhou, Q. Shao, and D. J. Mulla, 2010. "Remote sensing of sea surface temperature and chlorophyll-*a*: Implications for squid fisheries in the north-west pacific ocean," *Int. J. Remote Sens.*, vol. 31, no. 17, pp. 4515–4530.
- [8] F. A. Postuma and M. A. Gasalla, 2010. "On the relationship between squid and the environment: Artisanal jigging for *Loligo plei* at São Sebastião Island (24°S), southeastern Brazil," *ICES J. Mar. Sci.*, vol. 67, no. 7, pp. 1353–1362.