

Mexico La Encrucijada Biosphere Reserve artisanal White shrimp - cast nets

White shrimp Fishery Improvement Project, La Encrucijada Biosphere
Reserve, Chiapas



BIOLOGICAL AND PHYSICAL DATA SAMPLING PROGRAM

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1. INTRODUCTION

The state of Chiapas has a 270 km coastline, in which estuaries and lagoons are located, subdivided into three subsystems that are Dead Sea: La Joya Buena Vista, Carretas Pereyra and Chantuto -Panzacola. In the latter is located the La Encrucijada reserve, made up of mangroves and wetlands, these being one of the most important nationally and internationally. Therefore, La Encrucijada was declared a RAMSAR site on March 20, 1996 (RAMSAR) (SEMARNAT and The National Commission of Aquaculture and Fisheries, 2009).

La Encrucijada was declared a Biosphere Reserve, on June 6, 1995, as a Biosphere Reserve, with 144,868 Ha, of which 36,216 Ha correspond to two core zones and 108,652 Ha as a buffer zone. The Reserve is located in the south of the state of Chiapas, (figure 1), in the municipalities of Pijijiapan, Mapastepec, Acapetahua, Villa Comaltitlán, Huixtla and Mazatán 2. In the core area is the community of El Castaño, the island and community of La Concepción.

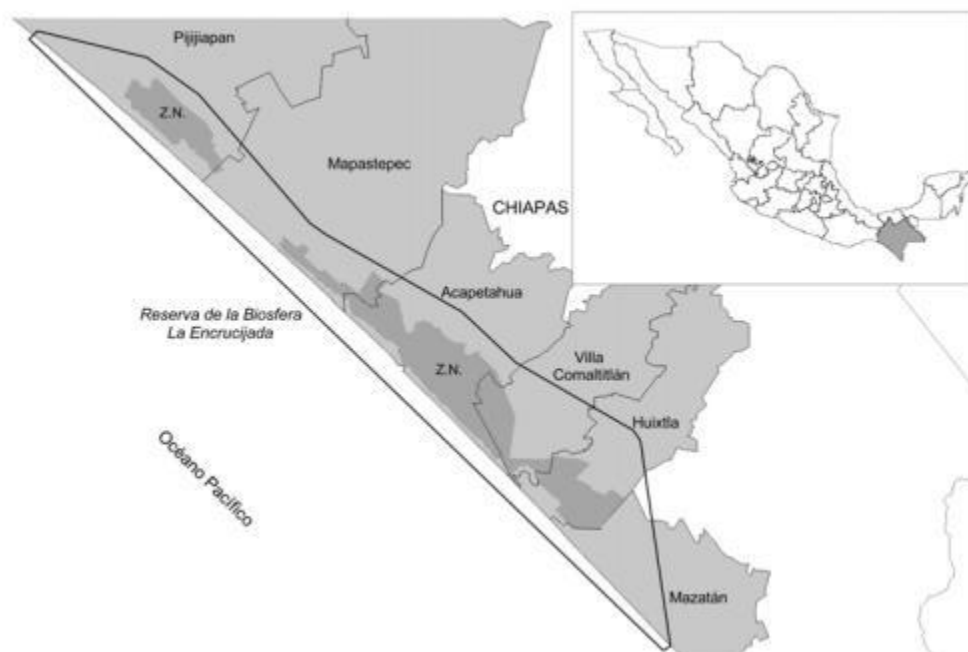


Figure 1. La Encrucijada Biosphere Reserve, Chiapas, Mexico (CONANP-FMCN 2003).

Fishing activities are the main sources of protein and livelihood for the local communities and approximately 18 small-scale cooperatives (600 fishermen) hold permits and/or concessions for shrimp and finfish, in the REBIEN (SEMARNAT-CONANP 2009; Rodríguez-Perafán, 2014 ; Armengol et al., 2021). White shrimp (*Litopenaeus vannamei*) is the most important commercial species due to its price and average annual production (~2,800 tons) (SAGARPA 2006).

2. GENERAL OBJECTIVE

To evaluate the abundance and population parameters of white shrimp (*Litopenaeus vannamei*) in the La Encrucijada Biosphere Reserve, Chiapas.

Specific objectives

- 1.- Determine the spatio-temporal distribution of the abundance of the white shrimp population.
- 2.- Evaluate the environmental impact of the shrimp fishery in the La Encrucijada Biosphere Reserve.
- 3.- Determine the composition of the bycatch in the shrimp fishery.
- 4.- Determine the hydrological variability and its relationship with the abundance of shrimp in the REBIEN.

3. MATERIALS AND METHODS

During an annual cycle, starting in November 2022 and reporting until December 2023, biological monitoring actions were carried out for the target species of the FIP white shrimp (*Litopenaeus vannamei*), as well as the registration of the accompanying fauna in the fishing area. On the other hand, in the same biological stations, water quality monitoring was implemented, with the objective of knowing the behavior of the physicochemical variables of the water and identifying correlations with the results obtained in fisheries monitoring.

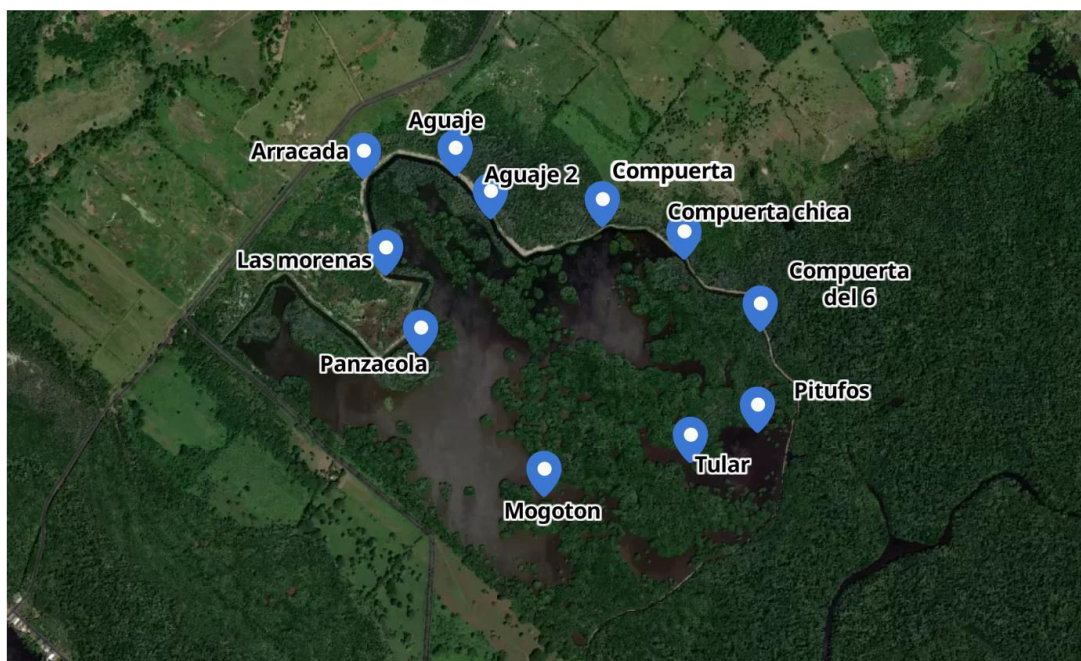


Figure 2 . Location of the biological sampling sites of the fishing system of the Sociedad Cooperativa el Carrizal, Pijijiapan, Chiapas.

The monitoring activities were carried out together with the fishermen of the fishing cooperatives. As part of these activities, the sampling points were defined based on the information existing in previous studies and the management of the fishing area according to the fishermen (Fig. 2 and 3).

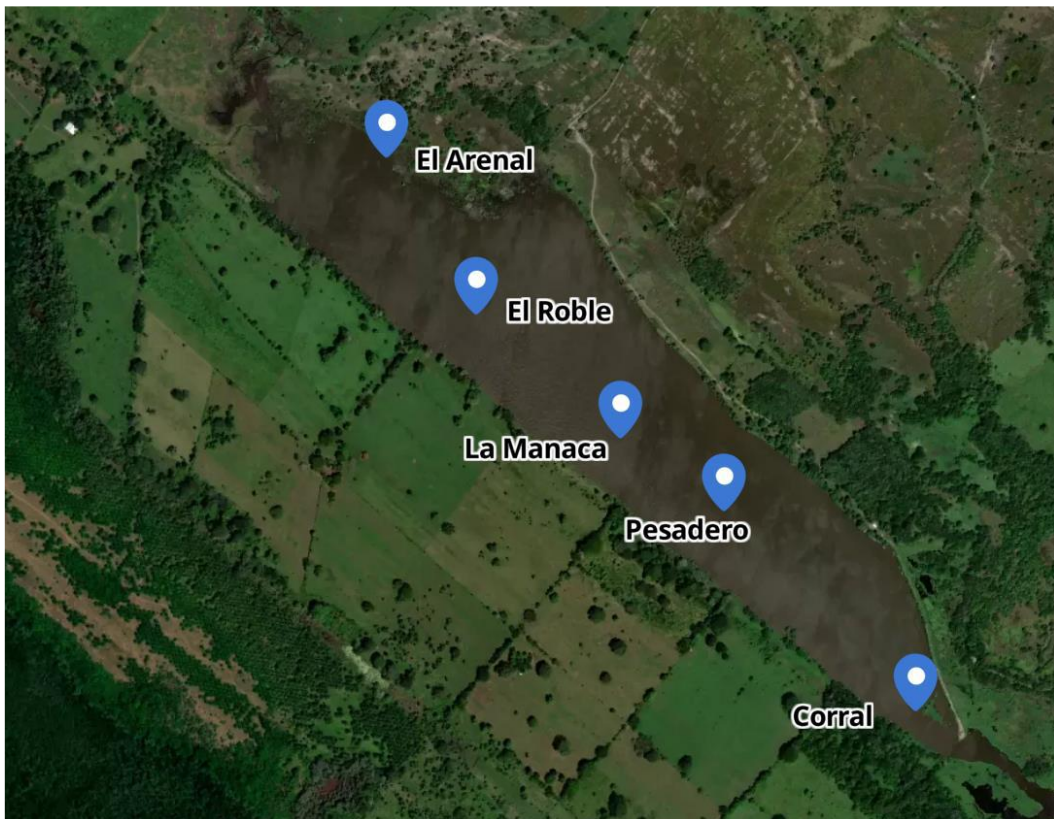


Figure 3. Location of the area where monitoring was implemented for the El Carrizal Cooperative Society, Pijijiapan, Chiapas.

The monitoring was implemented with a duration range of 4 hours, generally starting at 8 in the morning and ending at 11 or 12 noon . This activity is carried out with smaller rowing boats, with a cast net measuring 1 ¹/₄" , and is also complemented with the use of multiparametric probes for readings of the physicochemical variables of the water, such as: .Temperature (° C), Salinity (oops), Dissolved Oxygen (mg/L), as well as pH and Conductivity.

At each monitoring station, 3 hauls were made with cast nets measuring 1 inch long (Fig. 4 and 5), where biometric data were collected by species and individual, number of organisms per haul and station, and a list of species. captured. This information will be used to analyze fishing effort, abundance and diversity of species by fishing sites.



Figure 4. Implementation of monitoring activities in Agostaderos de Topón using the cast net to capture organisms.

A database was generated with the results obtained during the monitoring activities, this by fishing organization. In this sense, the main findings obtained are described below.

In addition, diversity studies will be carried out using the Simpson index to determine the most dominant and Moner species in each fishing area.

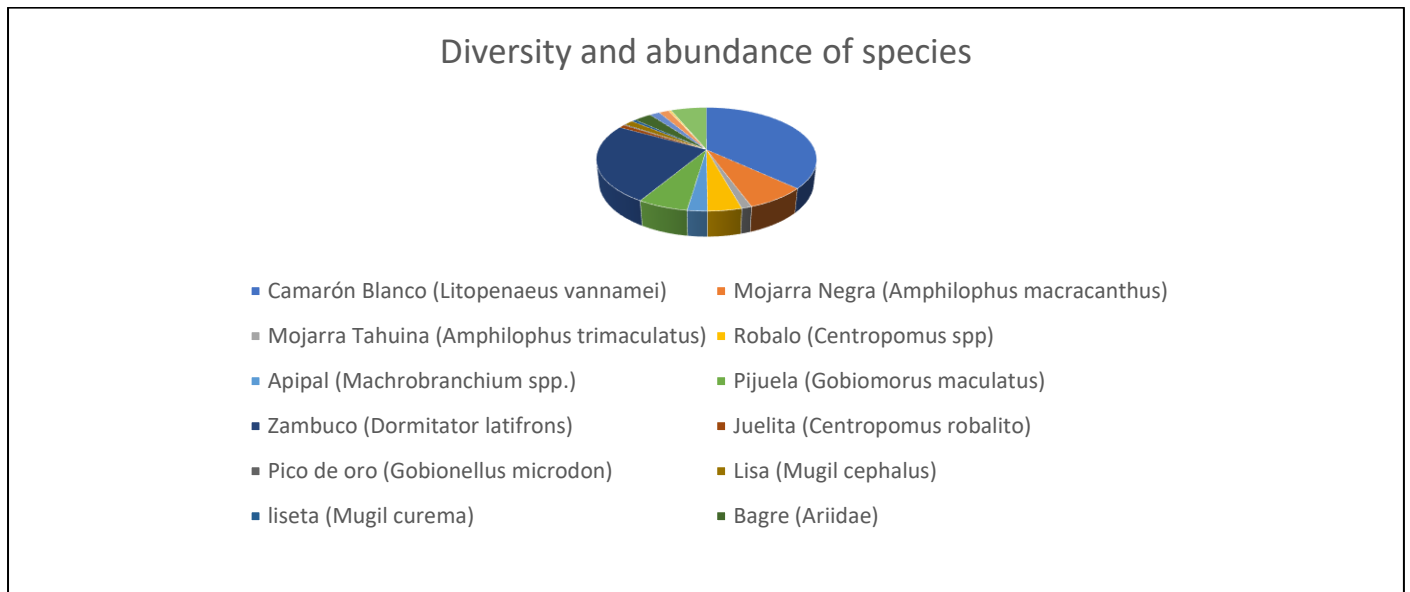


Figure 5. Implementation of monitoring activities in El Carrizal.

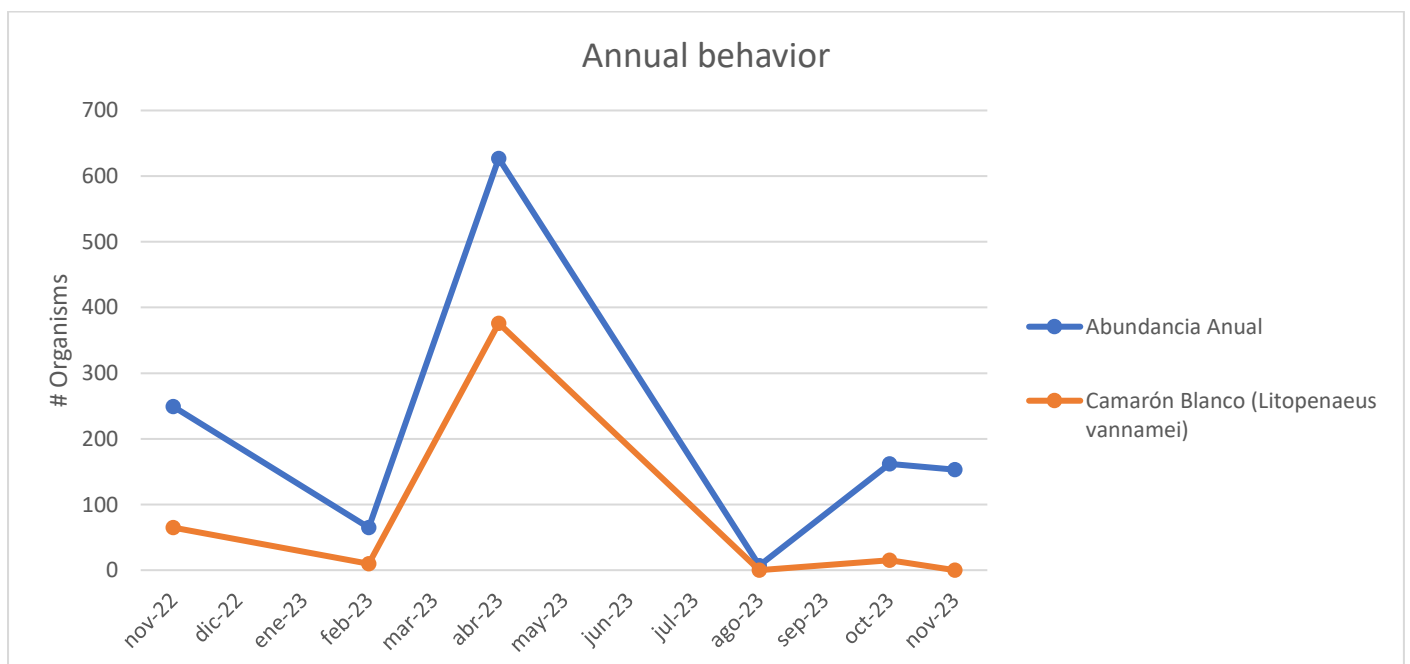
4. RESULTS.

SCPP Agostaderos de Topón:

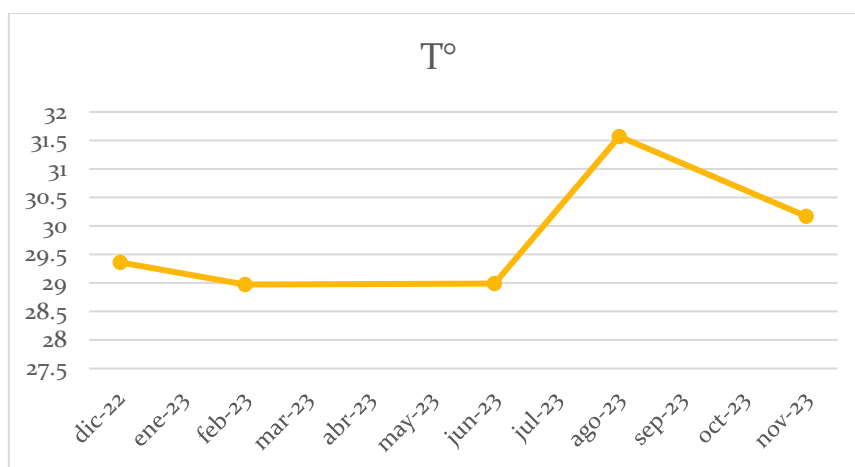
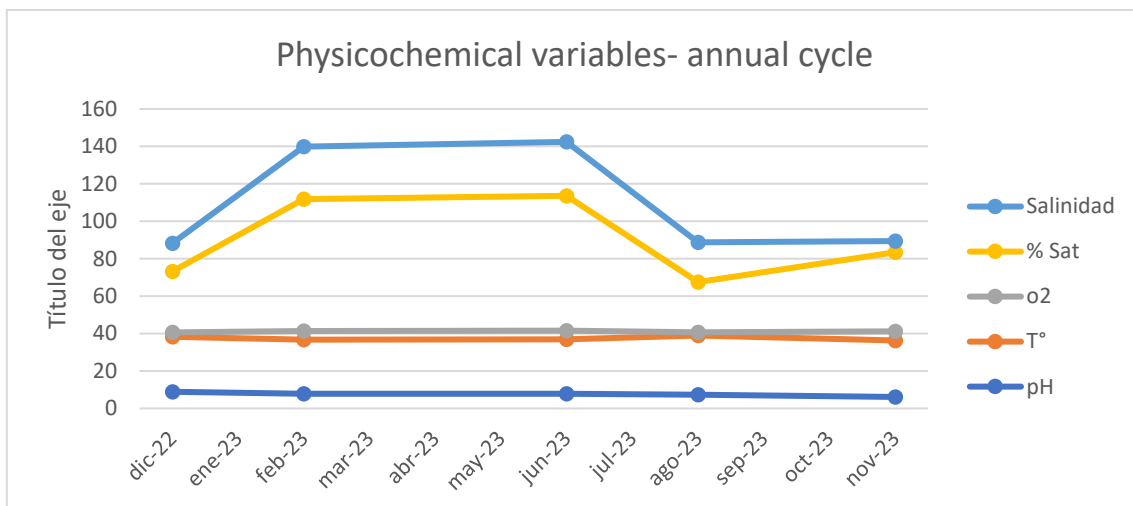
The presence of 17 species that serve as accompanying fauna for the target species, which is white shrimp, was determined. This last species being the one with the greatest abundance in the fishing area, followed by a species of scale known locally as Zambuco (*Dormitator latifrons*). As well as a grand total of 1,263 organisms captured during the process.



The period that presented a highest peak of productivity was in April 2023, where both the target species presented a significant abundance, as well as the accompanying fauna.

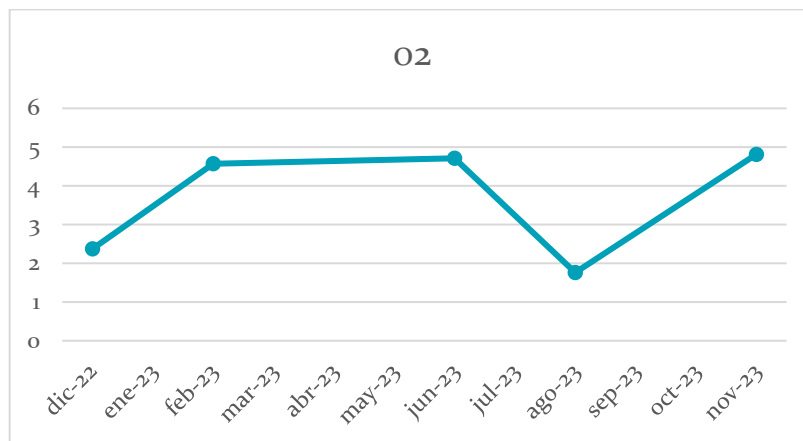
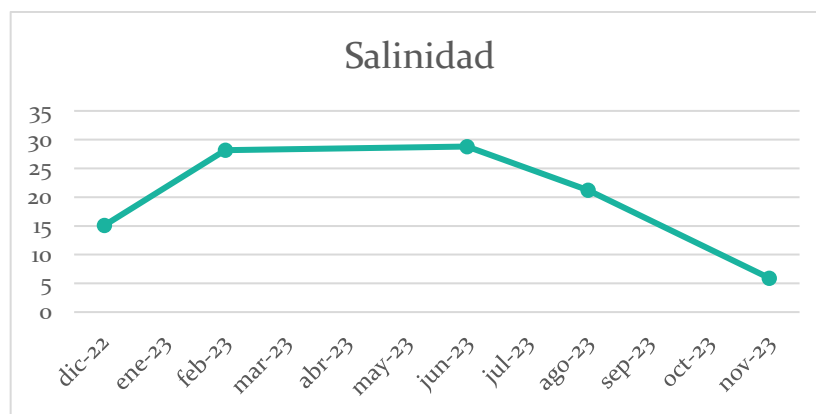
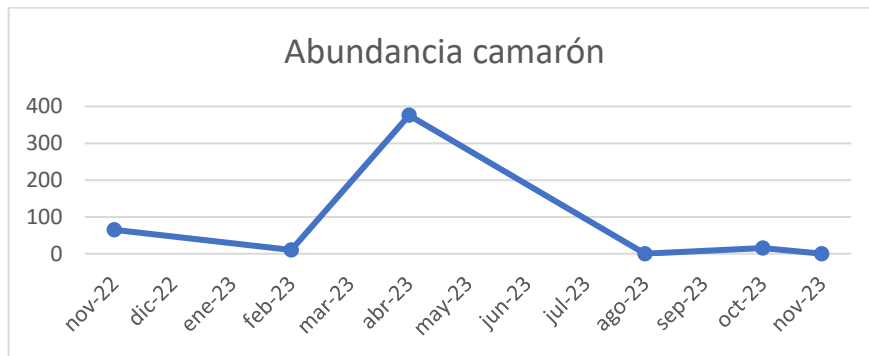


The physicochemical variables in the water had variations during the annual cycle, of which the most notable are: temperature, salinity, saturation % and dissolved oxygen.



An inversely negative correlation was identified between water temperature and productivity in the lagoon system, considering that during the period when the temperature remained below 30°, production in the water was high.

The greatest point in the decrease in production coincides between June and August, just the months where the water temperature had the highest rise.

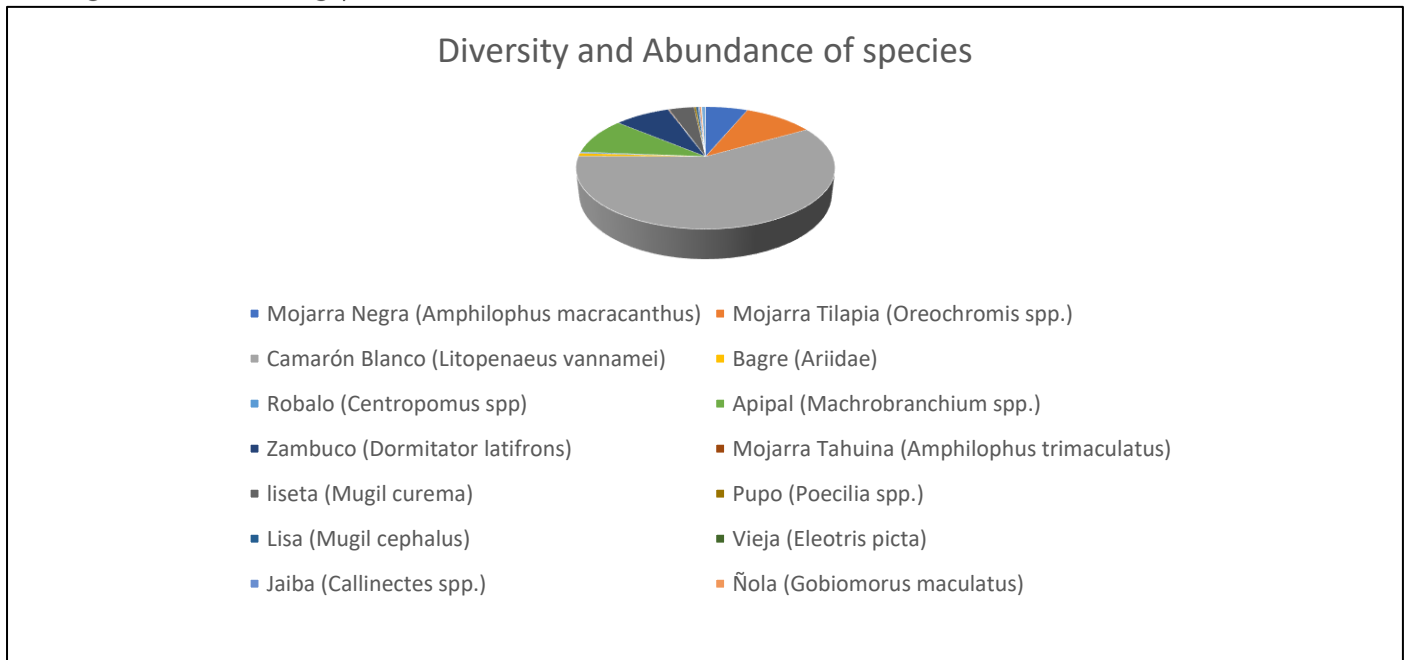


Another variable that presented a correlation with the abundance in the system was dissolved oxygen and salinity. Both variables presented an inversely positive correlation, that is, when they were at their highest concentration, production remained high, such is the case of dissolved oxygen, which presented an ascending peak in August, coinciding with the decrease in shrimp abundance. .

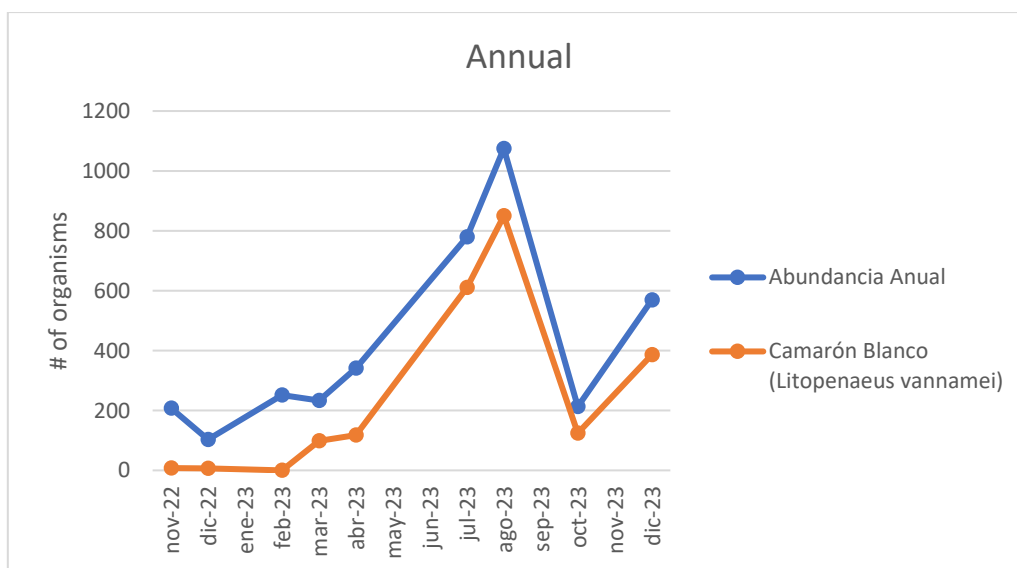
This lack of oxygen in the system harmed productivity, since shrimp production no longer recovered, generating losses for the fishing organization. It is estimated that production was going to be 50 tons.

SCPP El Carrizal.

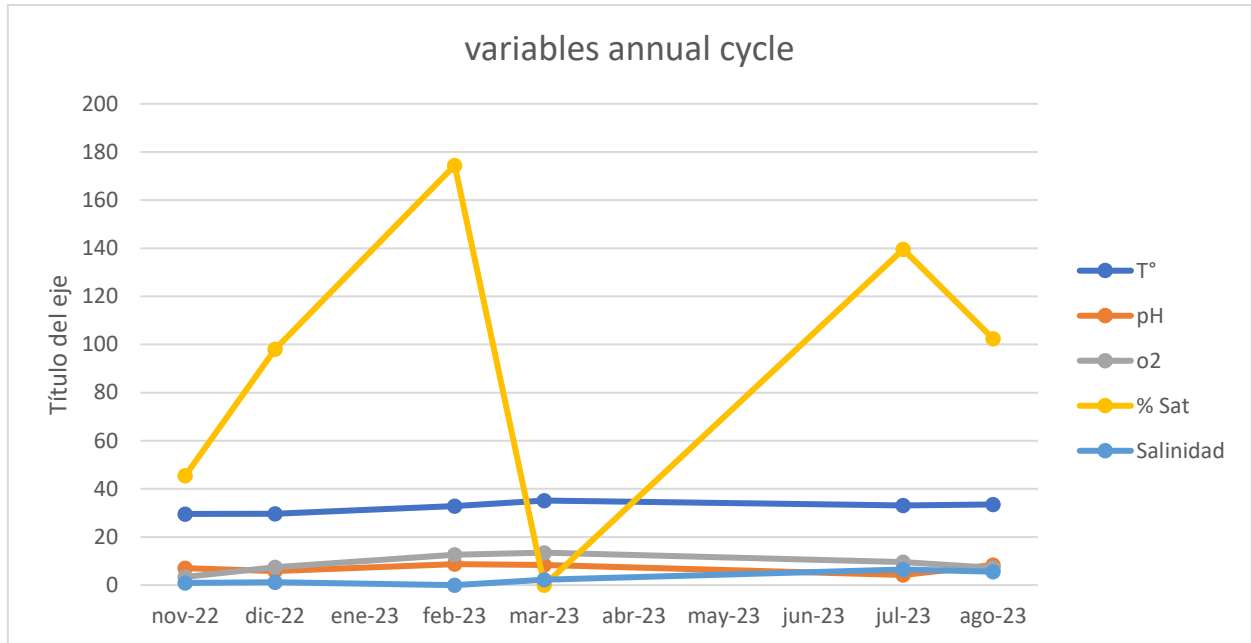
A total of 13 species were determined that serve as accompanying fauna for the target species, which is white shrimp. This species being the one that has the greatest abundance during monitoring activities, with second place we can find another crustacean known as Apipal (*Macrohbranchium spp*) locally. In general terms, a grand total of 3,772 organisms were captured during the monitoring process.



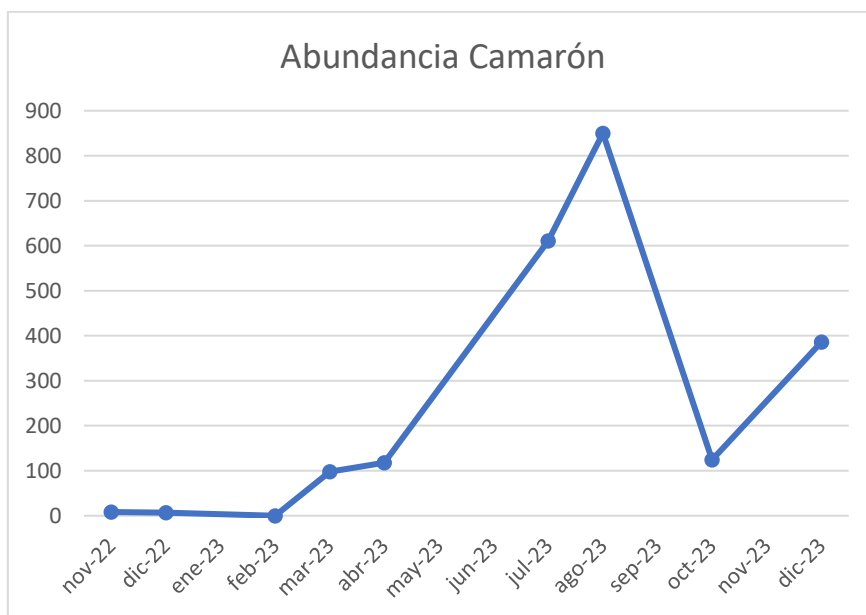
The period that presented a highest peak of productivity was in the month of July 2023, where the target species and the accompanying fauna presented a high abundance.

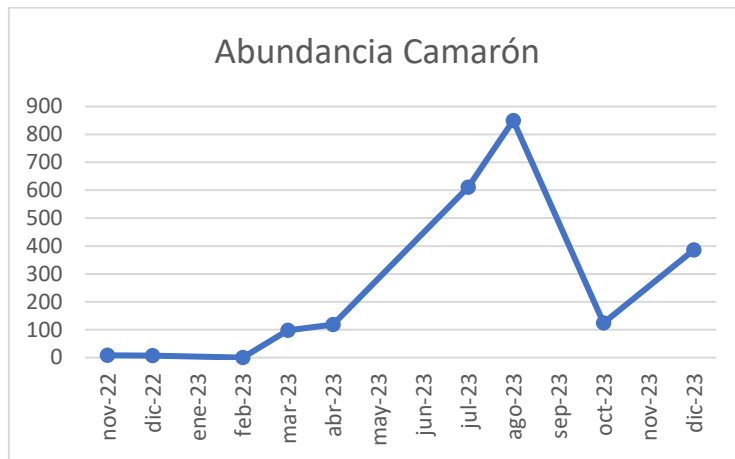
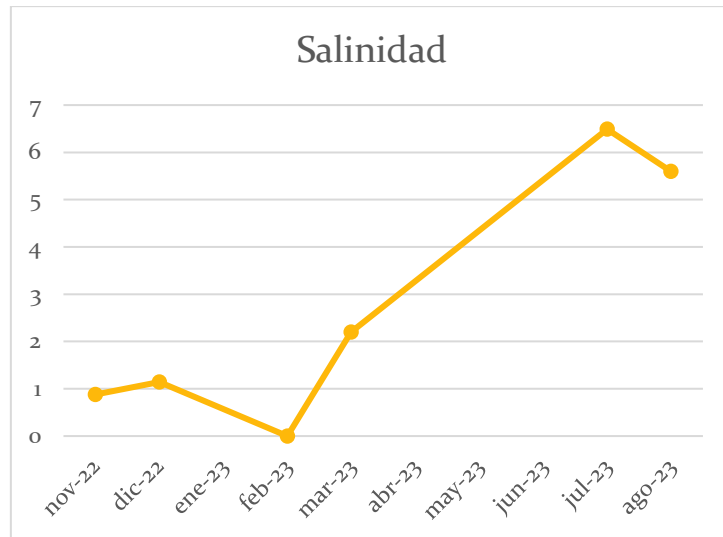


For the physicochemical variables of the water , monthly measurements were taken for each of them, having a value of 0 in the month of March for oxygen saturation, this derived from problems with the multiparametric probe.



It was identified that there is a positive correlation between the increase in salinity and the abundance of shrimp, presenting a gradual increase in the variable in March and observing the same trend with the abundance of shrimp.





On the other hand, a trend was identified in the presence of Oxygen in the system, this derived from the fact that during the months of low production in April, the Dissolved oxygen was in a high concentration, subsequently there was a decrease in this variable, this may be caused by the high demand for oxygen in the water derived from the high abundance of the species

