

# Intercultural Center for the Study of Deserts and Oceans (CEDO)

Monitoring bycatch in the blue swimming crab fishery, Puerto Peñasco-Puerto Lobos Biological Corridor, Sonora, Mexico

## Food Loss and Waste Measurement Case Study

### Organization

[CEDO](#) combines vision, leadership, knowledge, and experience to foster vibrant communities and resilient ecosystems. The organisation has been working in the northern Gulf of California for 40 years, as well as other ecoregions, by integrating people, knowledge, and solutions. More specifically CEDO have been working with small-scale fishermen and their communities to develop innovative and comprehensive solutions to the region's complex challenges, as well as a comprehensive plan for Integrated Coastal Management of Fisheries in the Puerto Peñasco-Puerto Lobos Corridor, strengthening a bottom-up management system that promises real solutions to the urgent challenges we face today.

### Introduction

The incidental capture and mortality of non-target marine animals during fishing is known as bycatch and is one of the principal threats to marine biodiversity worldwide.<sup>1</sup> In combination to impacts on biodiversity, unwanted fish discarded by commercial fishing operations are a loss in terms of a rich source of dietary protein.<sup>2</sup>

In Mexico, CEDO is currently leading a fisheries improvement project along the Puerto Peñasco-Puerto Lobos coastal corridor that seeks to improve commercial fishing operations for blue swimming crab (*Callinectes bellicosus*) and lead to more responsible and sustainable practices. Part of the project involves monitoring the levels of bycatch associated with the local crab fishery. CEDO had undertaken a similar exercise between 2008 and 2011 but now, more than 10 years later, wished to update the information and implement activities to improve the fishery, with a view to possible certification under the Marine Stewardship Council.

1) <https://www.bycatch.org/about-bycatch>

2) <http://www.fao.org/flw-in-fish-value-chains/value-chain/capture-fisheries/discards-and-bycatch/en/>

3) Inapesca, CRIP-Guaymas, COBI, CEDO, Okeanos-Oceanides, SFP y Cibnor-Guaymas. 2011. Protocolo de monitoreo de fauna de acompañamiento en la captura de jaiba verde (*Callinectes bellicosus*) realizada en Sonora y Sinaloa. México. 6pp.

### What was measured?

As part of the fisheries improvement projects in Sonora, Mexico, CEDO is undertaking a bycatch monitoring exercise in an attempt to move toward increasingly responsible and sustainable practices within the local blue swimming crab fishery.

### How was it measured?

The bycatch monitoring exercise began in July 2020 and took place with the support of two community support monitors in fishing fleets at San Jorge Bay (Bahía de San Jorge) and La Pinta, using a monitoring protocol reviewed by the National Fisheries Institute of Mexico (Inapesca).

### What were the outcomes?

The analyses showed that the ratio of target catch to bycatch in crab traps ranged from 36 grams to 74 grams of bycatch for each kilogram of crab caught., This represents a total weight of between 8.9 and 18.6 metric tons of bycatch for the 2020 season in the study area.

### FLW Measurement Methods

The bycatch monitoring program began in 2020 with the support of two community monitors in the San Jorge Bay and La Pinta fleet, using a monitoring protocol reviewed by the National Fisheries Institute of Mexico (Inapesca). A previous methodology, developed in 2011, was used as a guide for the monitoring protocol.<sup>3</sup> The methodology helps fishermen characterise and update information on bycatch within the fishery to provide a better understanding of the relationship between crab catches and the accompanying fauna.

The sampling of bycatch differed slightly between the two community monitors. For the vessel from the Bahía de San Jorge fishing grounds, sampling was based on the collection of information in the fishing log, which records

## Results

bycatch during one fishing day every fifteen days. On the other hand, the boat from the La Pinta fleet records several different metrics each day, including the species, sex, and maturity of the catch.

Prior to the start of the monitoring activities, CEDO identified key people in the local communities (captains/ crew members), who were willing to collect data for the project. The individuals recruited were given training on the monitoring protocol to be used, as well as the materials necessary to conduct the exercise (e.g., logbooks, scales, GPS devices, waterproof suits, and rubber boots). Later, training was also carried out for each recruited monitor in the CEDO facilities so that data collection methods were standardized across the project. The monitors were then required to produce logs of observed bycatch every 30 days.

The data collected by the monitors were transcribed into Excel for analysis. The commercial blue swimming crab season began on July 1st and ended on December 7 at La Pinta and on November 19 at Bahía de San Jorge. The bycatch monitoring starting dates for each community monitor as well as the number of bycatch samples taken and recorded numbers can be seen in Table 1. Results suggest that the total bycatch weight for the two sampling sites was approximately 77.7 kg: 33.4 kg for Bahía de San Jorge and 44.3 kg for La Pinta. The breakdown of the individuals caught per species at each site can be seen in Table 2.

The analyses show that the ratio of target catch to bycatch in crab traps ranged from 36 grams to 74 grams of bycatch for each kilogram of crab, from 3.67% to 7.48% in relation to the total catch per trap with a decreasing trend as the fishing season progresses. Catch yields during the sampling period can be seen in Table 3.

Table 1. General monitoring data

Site	Monitoring period	Bycatch samples	Record numbers
Bahía de San Jorge (BSJ)	July 11 to Nov 30, 2020	9	108
La Pinta	July 16 to Nov 01, 2020	9	231

Table 2. The species and total weight (grams) caught at each fishing site

Common name	Scientific name	BSJ	La Pinta	Total general
<b>Bullseye puffer fish</b>	<i>Sphoeroides annulatus</i>	22610	15937	38547
<b>Spotted sand bass</b>	<i>Paralabrax maculatofasciatus</i>	497	2617	3114
<b>Pacific spadefish</b>	<i>Chaetodipterus zonatus</i>	-	71	71
<b>Northern Radix or Black murex snail</b>	<i>Muricanthus nigrinus</i>	193	-	193
<b>Pink-mouthed murex snail</b>	<i>Phyllonotus erythrostoma</i>	2050	12737	14787
<b>Finescale triggerfish</b>	<i>Balistes polylepis</i>	7880	-	7880
<b>Grunts, Burrito</b>	<i>Haemulon sp.</i>	-	44	44
<b>Various box crabs of the Hepatus genus</b>	<i>Hepatus spp.</i>	191	12946	13137
<b>Total</b>		<b>33421</b>	<b>44352</b>	<b>77773</b>

Table 3. Target catch of swimming crab, bycatch, and total catch in traps during monitoring

	July	August	September	October	November
<b>Swimming crab average catch kg/day/vessel</b>	64.75	59.33	72.66	80.8	60.33
<b>Bycatch average catch kg/day/vessel</b>	4.67	4.82	4.52	4.7	2.39
<b>Capture total kg (swimming crab+bycatch)</b>	69.35	64.13	77.16	85.5	62.63

## Outcomes

During the season, a total of 93 tons of crab were caught in La Pinta and 155.9 tons in Bahía de San Jorge, for a total of 249 tons for the area. Both the 2019 and 2020 crab harvest seasons were unusually low compared to the historical record catches of around 800 metric tons for that area.

The initial fishing effort in La Pinta involved 15 vessels and in Bahía de San Jorge it involved 23, with a decreasing trend in crab catches observed towards the end of the season at both sites. The average number of traps per vessel was 132 in La Pinta and 109 in Bahía de San Jorge. It is estimated that the total amount of bycatch in the area represents a weight of between 8.9 and 18.6 tons; however, it is worth mentioning that the weight of the hermit crabs captured in the sampling was not quantified as it was considered mostly dead shell.

None of the observed species of bycatch were registered as under national or international IUCN, CITES or NOM-059 protective status. However, they may still represent a loss of a rich source of dietary protein within the blue swimming crab fishery.

The project has highlighted the fact that bycatch within the blue swimming crab fishery in Sonora, Mexico, is still an issue. As a result, CEDO has been working with local fishermen to help improve the efficiency of the crab traps used, in attempt to reduce levels of bycatch and subsequent waste. It is hoped that this study into the efficiency of crab traps will identify measures necessary to reduce bycatch in this area and provide a best practice example which can be adopted in other crab fisheries around the world.

In addition to this project, CEDO has also been looking at ways food loss and waste can be reduced across the whole crab supply chain, and not just within primary production. In the future, CEDO aims to work with crab processing plants to determine the amount of food loss and waste produced in the processing plants and identify measures that can be taken to reduce and make use of the food loss and waste that is generated.

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- Nélide Barajas, Executive director

**“Monitoring bycatch in the crab fishery can help us identify opportunities to avoid waste, but it can also be a business opportunity.”**

**- Bahía de San Jorge fishermen**