# PLENARY 08

*23rd Meeting of the*
*International Scientific Committee for Tuna*
*and Tuna-Like Species in the North Pacific Ocean*
*Kanazawa, Japan*
*July 12-17, 2023*

# MEXICAN NATIONAL REPORT TO THE 23rd ISC

Instituto Nacional de Pesca y Acuacultura (INAPESCA) and FIDEMAR

**July 2023**

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**INTRODUCTION**

This national report describes the recent trends of the Mexican tuna fishery for the tuna and tuna-like species in ISC area

In Mexico, the National Institute of Fisheries and Aquaculture (Instituto Nacional de Pesca y Acuacultura, INAPESCA, formerly INP), was created more than sixty years ago to systematically conduct scientific work and fisheries research with the marine resources of Mexico. The INAPESCA is responsible of providing the scientific bases for the management advice to the fisheries authorities in México and has stablished along its coastal states, in both, Pacific and Gulf of Mexico, 14 regional fisheries centers (CRIPs) which are the centers and laboratories in charge of data collecting, sampling, monitoring and assessment of the main fisheries and aquaculture activities on a regional scale. Since 1992, the INAPESCA incorporated to this effort, the work of the National Tuna-Dolphin Program (Programa Nacional de Aprovechamiento del Atún y Protección del Delfín, PNAAPD of FIDEMAR), which closely monitors and study the tuna fishery of its purse seine and longline national fleets. The data here reported is based on the combined efforts from these different and unified groups.

**1. SHARKS**

Mexico participated in the Blue Shark (*Prionace glauca*) Stock Assessment Online Meeting in April 19-22 and April 26-28, 2022 (JST), together with members from Canada, Chinese Taipei, Japan and the United States of America (USA). During the meeting, the work plan for the stock assessment report was established, agreeing:

1) Finalize the base case model results, model diagnostics, sensitivity analysis, and future projection by May 10, 2022 (JST).
2) Review, finish and submit the Stock Assessment Report before June 1, 2022 (JST).
3) Discuss the methodology of sensitivity analysis with a group approach. Combining the results of each sensitivity analysis with the three models: S6CPUE model, S11CPUE model and S11CPUE model with down weighting of size data for F20: TW_SM: TW_SM); with the weighting of 50%, 25% and 25%, respectively.
4) Plot the sensitivity result points on the Kobe plot except for the CPUE scenarios.
5) For the sensitivity analysis with late CPUE scenarios, the WG agreed to plot the time series of SSB and F with the RMS level.
6) Present the results of the ensemble approach for future projections.

At the end of 2022 the Mexican Delegation of the ISC Shark Working Group (SWG) participated in the 4-day hybrid meeting held at the Fisheries Resources Institute (FRI) in Shimizu, Shizuoka from December 8-12. One of the goals of the workshop was to review the biological parameters used in the previous benchmark stock assessment of shortfin makos, *Isurus oxyrinchus*, in 2018. In that sense, Mexico presented an update of the age and growth of shortfin makos from the Mexican Pacific, based on the analysis of growth band counts from dorsal vertebrae of 198 individuals caught during 2008–2018. A comparison of different models (both deterministic and stochastic) to re-estimate the growth of blue shark females from Mexican waters, based on length-at-age data obtained from counting growth bands in sectioned vertebrae of 272 sharks was presented too. The suitability of the new growth estimates due to the limited data of certain sizes and sexes were discussed by the SWG. The differences in age at maturity of shortfin makos

between eastern and western Pacific were also discussed, however it was indicated that as this species is treated as a single stock in the region. The SWG encouraged more work to be done on these topics.

### 1.1. Mexican blue shark catch

For the following stock assessment of the blue shark, Mexico updated its historical series of annual catches incorporating the years 2021–2022, which were provided by the Mexican administrative fisheries authority (CONAPESCA) based on official statistics that report specifically blue shark. The total historical blue shark catch provided by Mexico cover the period of 1976–2022 (Table 1 and Fig. 4). The blue shark is the shark species with the highest catches in volume and number of individuals reported in the Mexican North Pacific (Castillo-Géniz et al, 2017). Blue shark catches in the Pacific have experienced a sustained gradual growth that began in 1990 with 2,450 t until 2014, when it reached the record figure of 5,502 t. In the following years, there was a decrease in the annual catches, reaching a minimum of 2852 t in 2018 and then a new increment during the recent years up to 4749 in 2022. Since the distribution and abundance of blue sharks are highly sensitive to changes in ocean temperature, as has been reported in various regions of the world, it's plausible that this decrease is related to the oceanographic phenomena of ocean warming that have been observed in recent years in that region (Godínez-Padilla et al., 2022).

In addition, it can be postulated that some effects of a possible change in fishing strategies in part of the Mexican fleet can be also involved. It appears that some fleets are increasing their proportion of night sets in an effort to catch other species (like swordfish), with an associated fall in catch of blue shark. Figure 1 shows the trend of the proportions of sets with zero catches of blue shark and swordfish. As can be seen the ascending trend of sets with no catch of blue shark is accompanied by a corresponding descending one of the proportions of sets with no swordfish catch.
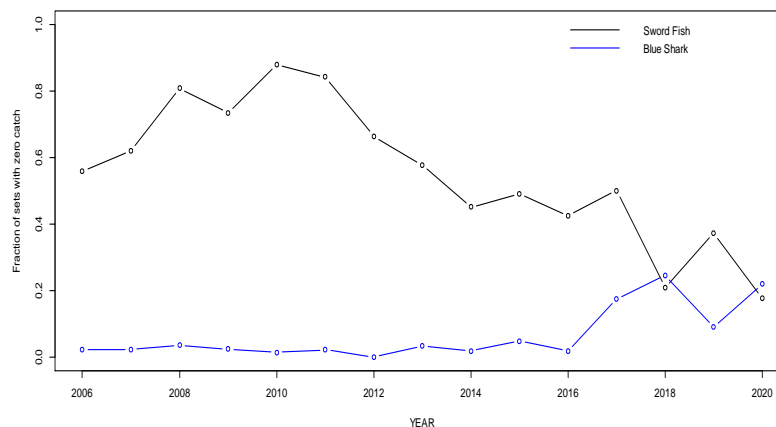


**Figure 1.** Trend of the proportions of sets with zero catches of blue shark and swordfish in the Mexican Pacific longline fishery, 2006-2020.

Figure 2 shows the trend of the proportions of positive sets for swordfish of the two main longline fleets operating in the Mexican Pacific. While the fraction of positive sets for swordfish remains relatively stable around 0.6 since 2012 in the Ensenada fleet, the corresponding proportion for the Mazatlán fleet goes from around 20% to above 90% in the same period.
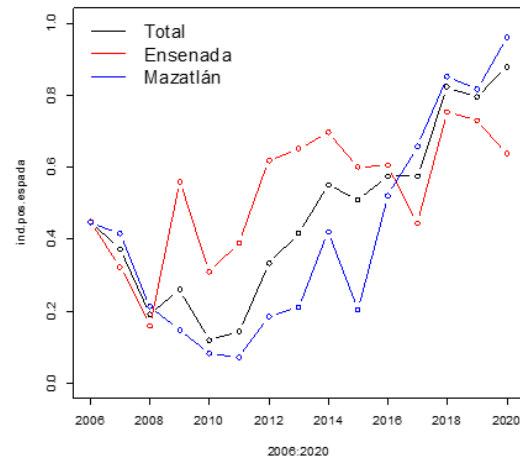
**Figure 2.** Trend of the proportions of positive sets for swordfish in the Mexican Pacific longline fleets, 2006-2020.

This can be the result of changes in operation of the fleets involved. The fleet operating from Mazatlán, has been changing its fishing patterns in recent years, from day sets to predominantly night sets (Fig.3).
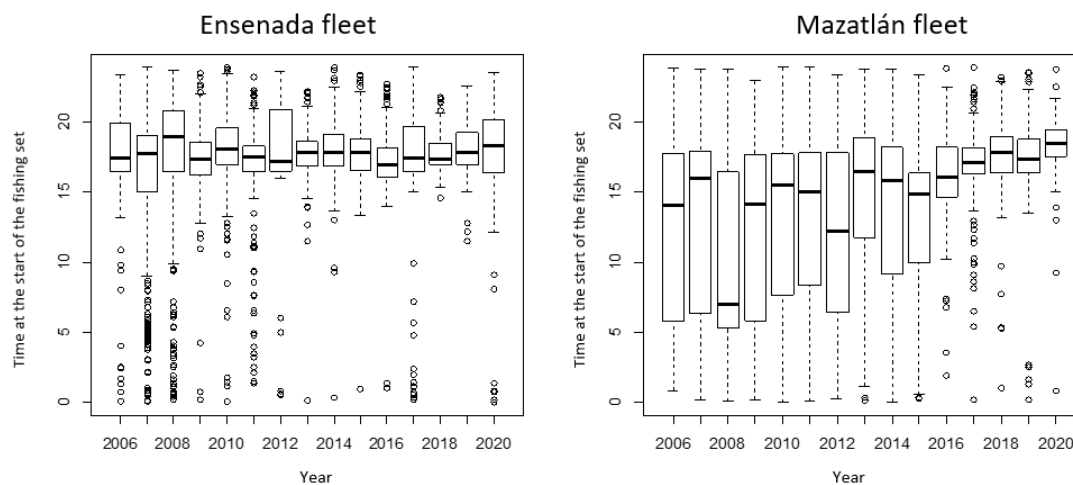


**Figure 3.** Changes in time at the start of the fishing set (from 0 to 24 hours) in the Ensenada and Mazatlán fleets, 2006-2020.

Mexican shark catch statistics by species were not available until 2006, so past blue shark catches had to be estimated. For the period of 1975 to 2006, estimations assume that blue shark has been represented in total catches with different proportions through time. The values of the blue shark catch proportions were obtained from diverse sources as published articles, grey literature, and more detailed local statistics (Sosa-Nishizaki, 2013) and catches provided by CONAPESCA (Sosa-Nishizaki and Castillo-Géniz, 2016). The main states where blue shark captures have historically been reported in the Mexican Pacific are: Baja California (BC) 45%, Baja California Sur (BCS) 26%, Sinaloa (SIN) 14%, Colima (COL) 12% and finally Nayarit (NAY) 3%.

**Table 1.** Historical series of annual catches (tons) of blue shark reported by State in the Mexican Pacific period 1976–2022. Sources: Period 1976–2014 Sosa-Nishizaki and Castillo-Géniz, 2016; Period 2015–2022 CONAPESCA.

| Year | BC | BCS | SIN | NAY | COL | TOTAL |
|------|------|------|------|-----|------|-------|
| 1976 | 25 | 291 | 28 | 7 | 22 | 373 |
| 1977 | 14 | 315 | 28 | 9 | 19 | 385 |
| 1978 | 14 | 467 | 31 | 25 | 25 | 562 |
| 1979 | 17 | 194 | 41 | 64 | 23 | 339 |
| 1980 | 32 | 193 | 7 | 61 | 44 | 337 |
| 1981 | 44 | 87 | 24 | 66 | 35 | 256 |
| 1982 | 71 | 139 | 23 | 43 | 29 | 305 |
| 1983 | 63 | 143 | 18 | 27 | 42 | 293 |
| 1984 | 41 | 105 | 20 | 18 | 79 | 263 |
| 1985 | 15 | 140 | 16 | 17 | 40 | 228 |
| 1986 | 31 | 203 | 13 | 28 | 131 | 406 |
| 1987 | 54 | 144 | 16 | 14 | 23 | 251 |
| 1988 | 63 | 402 | 12 | 12 | 20 | 509 |
| 1989 | 34 | 157 | 12 | 22 | 55 | 280 |
| 1990 | 212 | 450 | 17 | 22 | 429 | 1130 |
| 1991 | 149 | 404 | 16 | 22 | 424 | 1015 |
| 1992 | 276 | 668 | 15 | 19 | 659 | 1637 |
| 1993 | 938 | 770 | 141 | 15 | 676 | 2540 |
| 1994 | 827 | 486 | 74 | 17 | 352 | 1756 |
| 1995 | 572 | 778 | 48 | 19 | 682 | 2099 |
| 1996 | 825 | 813 | 96 | 16 | 1367 | 3117 |
| 1997 | 925 | 651 | 120 | 11 | 1241 | 2948 |
| 1998 | 1241 | 546 | 82 | 19 | 1247 | 3135 |
| 1999 | 792 | 1082 | 149 | 21 | 218 | 2262 |
| 2000 | 1404 | 908 | 193 | 48 | 166 | 2719 |
| 2001 | 1612 | 665 | 116 | 33 | 162 | 2588 |
| 2002 | 1552 | 566 | 170 | 28 | 207 | 2523 |
| 2003 | 1445 | 438 | 242 | 23 | 158 | 2306 |
| 2004 | 2265 | 611 | 694 | 37 | 175 | 3782 |
| 2005 | 1420 | 670 | 455 | 21 | 155 | 2721 |
| 2006 | 1474 | 622 | 551 | 17 | 102 | 2766 |
| 2007 | 1774 | 776 | 554 | 13 | 207 | 3324 |
| 2008 | 2088 | 1171 | 812 | 57 | 227 | 4355 |
| 2009 | 2438 | 949 | 779 | 48 | 209 | 4423 |
| 2010 | 2206 | 1523 | 540 | 93 | 107 | 4469 |
| 2011 | 1810 | 1228 | 477 | 47 | 157 | 3719 |
| 2012 | 2078 | 1242 | 501 | 36 | 251 | 4108 |
| 2013 | 2474 | 996 | 365 | 378 | 282 | 4495 |
| 2014 | 2333 | 921 | 1719 | 145 | 383 | 5501 |
| 2015 | 2117 | 376 | 1142 | 47 | 303 | 3985 |
| 2016 | 2289 | 1142 | 293 | 961 | 288 | 4973 |
| 2017 | 1537 | 303 | 1183 | 45 | 316 | 3384 |
| 2018 | 1340 | 173 | 864 | 203 | 272 | 2852 |
| 2019 | 1585 | 557 | 1035 | 306 | 289 | 3772 |
| 2020 | 1565 | 756 | 865 | 77 | 270 | 3533 |
| 2021 | 2036 | 522 | 784 | 64 | 231 | 3637 |
| 2022 | 2474 | 381 | 1650 | 41 | 203 | 4749 |
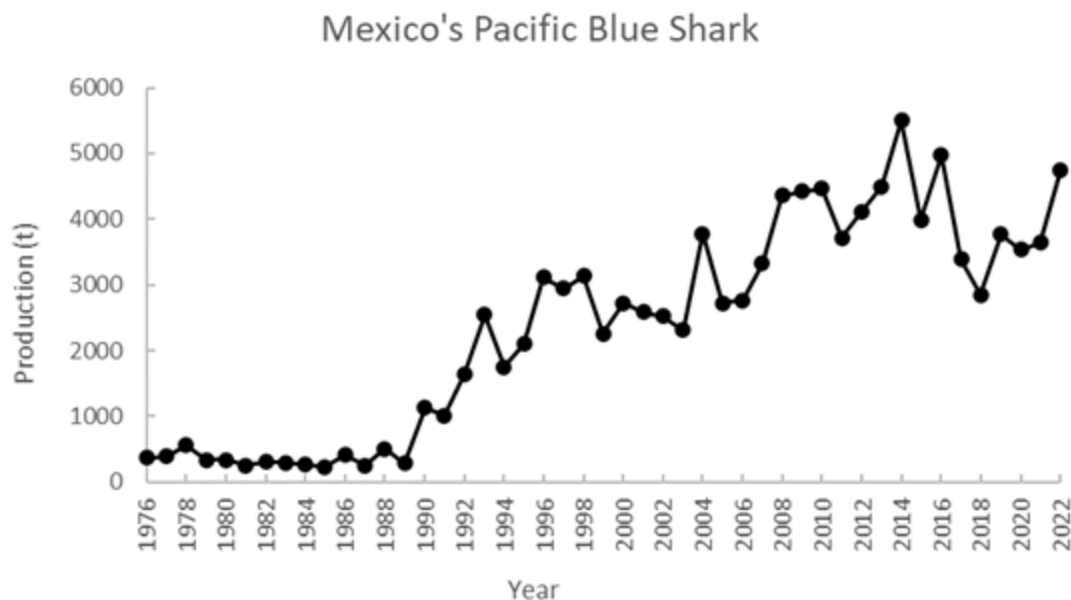
**Figure 4.** Historical series of annual blue shark catches in the Mexican Pacific for the period 1976–2022. Sources: 1976-2014 Sosa-Nishizaki and Castillo-Géniz, 2016; 2015–2022 CONAPESCA.

## 2. TUNAS

In this region the Mexican fleet concentrates mainly in the yellowfin (*Thunnus albacares*), which is the prime target tuna species. The Mexican tuna purse seine fishery is one of the largest in the (ETP) since the mid 1980's. YFT represents for its large volumes the main component of the catch by Mexico. Other tuna species which are also caught, but contrastingly in lower proportions are: the skipjack, (*Katsuwonus pelamis*), the black skipjack (*Euthynnus lineatus*) and more recently, in northerly zones of the Mexican EEZ, the bluefin (*Thunnus orientalis*) which is targeted by some vessels and sporadically the albacore (*Thunnus alalunga*). The fishing operations of the Mexican purse seine fishery comprise a vast area in the EPO, under the IATTC convention area.

The total tuna landings of Mexico in 2003 were 183199 mt. Catch which represents the highest historic record for this fishery. Comparatively, the lowest recorded capture in this fishery during recent years was in the 2006 season, with only 102472 mt., value which is closer to the 1980's development phase. After 2008 catch levels recovered. The fleet has compensated partially its catches primarily with skipjack.

These high consistent reported catches are the result of the combination of the fishing experience and performance of the fleet as well as the effect of high recruitments in previous years and are not related with any significant increase in the fishing effort or a greater expansion of its carrying capacity during the corresponding years. Lower catches in 2006 and 2007 are probably related to a decrease in population levels of yellowfin tuna (lower recruitment) and excessive catches of juvenile tunas in coastal areas in the EPO. In recent years catches have recovered to average levels.

The purse seine fleet is subdivided in purse seine vessels, most of them with observers on board all tuna fishing trips and a small quantity of pole and line vessels (Table 2). The whole fleet is quite stable in number, composition and carrying capacity since the 1990´s.

Yellowfin tuna always has been the primary catch, and skipjack is always second in volume. Other tuna species have high values because the fleet has compensated lower yellowfin catches with

other tunas, basically with skipjack but a slight increase is related also with Bluefin tuna catches (Table 3).

**Table 2.** Size, composition and carrying capacity of the active Mexican tuna fleet from 2007 to 2020, in EPO and ISC area.

| YEAR | No. of active tuna boats | No. of m PSeiners > 400 m3 | No. of PSeiners < 400 m3 | No. of active Bait Boats |
|------|------|------|------|------|
| 2007 | 55 | 42 | 11 | 2 |
| 2008 | 49 | 39 | 8 | 2 |
| 2009 | 46 | 38 | 6 | 2 |
| 2010 | 42 | 36 | 3 | 3 |
| 2011 | 43 | 38 | 3 | 2 |
| 2012 | 45 | 39 | 3 | 3 |
| 2013 | 43 | 37 | 3 | 3 |
| 2014 | 47 | 42 | 3 | 2 |
| 2015 | 47 | 42 | 3 | 1 |
| 2016 | 47 | 42 | 3 | 1 |
| 2017 | 51 | 46 | 5 | 0 |
| 2018 | 53 | 48 | 5 | 0 |
| 2019 | 51 | 46 | 5 | 0 |
| 2020 | 48 | 44 | 4 | 0 |
| 2021 | 51 | 46 | 5 | 0 |
| 2022 | 52 | 47 | 5 | 0 |

**Table 3.** Total tuna landings of YFT, SKJ ALB by the Mexican fishery (2005-2020)

| YEAR | YFT | SKJ | ALB | PBF |
|------|------|------|------|------|
| 2005 | 113279 | 32985 | 0 | 4542 |
| 2006 | 68644 | 18655 | 109 | 9806 |
| 2007 | 65834 | 21970 | 40 | 4147 |
| 2008 | 85517 | 21931 | 10 | 4407 |
| 2009 | 99157 | 9310 | 17 | 3019 |
| 2010 | 101523 | 6090 | 25 | 7746 |
| 2011 | 102887 | 8600 | 0 | 2731 |
| 2012 | 93686 | 18259 | 0 | 6668 |
| 2013 | 113619 | 17185 | 0 | 3154 |
| 2014 | 120986 | 8777 | 0 | 4862 |
| 2015 | 106188 | 23497 | 0 | 3082 |
| 2016 | 93904 | 13286 | 0 | 2709 |
| 2017 | 80747 | 21400 | 0 | 3643 |
| 2018 | 102000 | 16700 | 0 | 2840 |
| 2019 | 106000 | 19700 | 0 | 2249* |
| 2020 | 102295 | 7240 | 0 | 3285 |
| 2021 | 108043 | 7995 | 0 | 3027 |
| 2022 | 119555 | 15609 | 0 | 3194 |

*this amount includes 245 tons of PBF released alive

### 2.1. Bluefin tuna

All the fishing zones for bluefin tuna used by the Mexican fleet are located in the Northwest side of the Baja California peninsula, inside the ZEE of Mexico, closer to the ranching locations in recent years. Recorded catches of PBF are registered from march to September, time in which the transpacific migration of this stock is closer to the Mexican Pacific coast, due to oceanographic factors. Sea conditions together with the presence of the specie permitted the development of this new fishery predominantly related to ranching activities in the Mexican Northwestern coastal area. Temperature is an important factor defining areas were PBF is to be found. The fishing season has shifted from May-June to the first quarter in recent years (2019-2022).

The time series of bluefin tuna captured by the Mexican tuna purse seine boats from 2005-2022 is presented in Table 3. This represents a small proportion of the Mexican tuna catch, although very valuable. The 3,700 mt. catch reported in 1996 was the first historic highest record for this fishery and the first year bluefin tuna has been targeted by the fleet. Again, in 2004 and 2006 new records were established for this tuna specie in Mexico. In 2007 the catch returned closer to the average. In 2009 due to the international economic crisis many companies did not operate and catches were below average. In 2010 catches increased again and since 2012, management measures were implemented in IATTC area limiting the PBF catch. The catch in the Eastern Pacific nevertheless is below the historic highs observed in the 1960's and 1970's. The information provided makes clear that fishing for bluefin has not being a foremost significant activity in Mexico for many years. It also shows that even in some fishing seasons there were no captures on this stock, or those were only of low levels. Therefore, it is clear that fishing bluefin in Mexico was considered only opportunistic. However, for more than 25 years (1996-to present time) there has been a greater interest devoted to this species, mainly for the ranching activities developed in the Northwest region of Mexico.

The catches of bluefin for ranching are performed only with commercial purse seiners (normally searching for YFT) with a deeper purse seine net. Bluefin tunas are transferred from the purse seine net to "transfer" nets then to the enclosures and fattening nets located in northern Baja California peninsula.

There is also a US sport fishery that operates in Mexican EEZ that is reported by the US.

### 2.2. Effort

Only 6 vessels participated in this fishery in 2022. In figure 5 the fishing area in the northern part of Baja California for 2022 fishing season is presented. Showing a relatively small area where effort is concentrated.
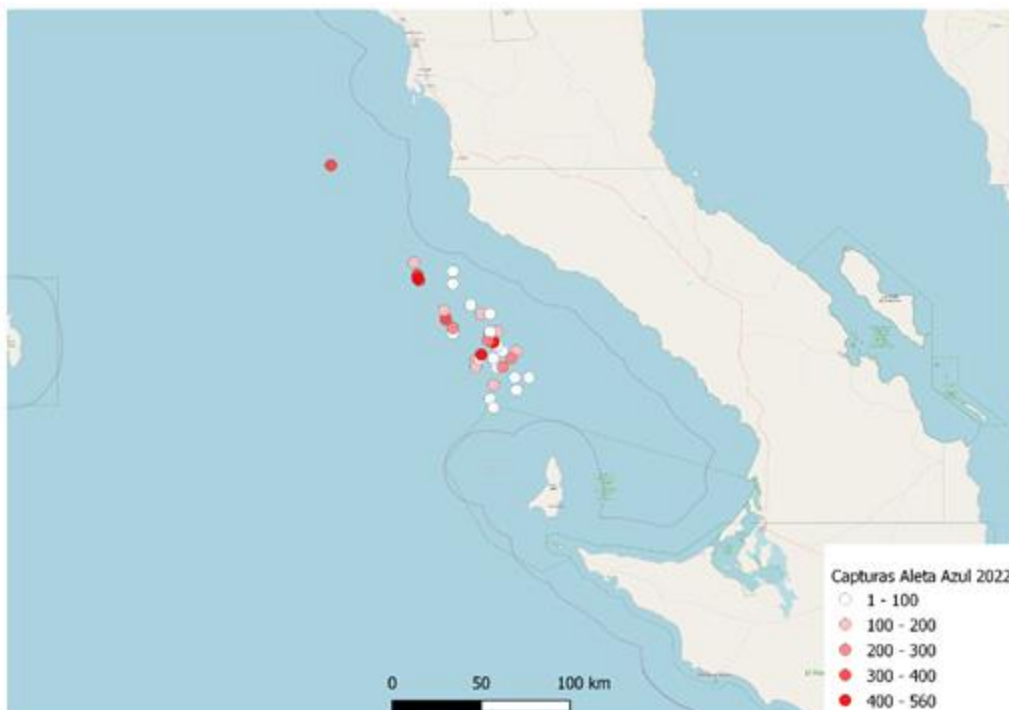
**Figure 5.** PBF fishing area in 2022.

### 2.3. Ranching Activities

Ranching activities started in 1996 but fully developed until 2001. Catch before 2012 (quotas implemented since that year) have been variable, making evident that oceanographic conditions and the eastern distribution of the species are limiting factors for the Mexican bluefin fishery. In 2005, 2006 an estimated 80% of the catch was transported to the ranching companies and the other 20% went to the Mexican market. In recent years, all PBF is used in ranching activities. This represents an economic incentive for the Mexican tuna fishery and has a regional economic impact especially in northwestern Mexico.

The size composition of the PBF catch for farming is obtained from stereoscopic cameras that are used during transfer operations. Information is available, used to estimate size composition of the catch and shared with ISC as well as IATTC.

### 2.4. Management

Management of the tuna fishery is done within the framework of the IATTC. For tropical tunas the main aspect of regulation is a time closure and for PBF a Catch quota. The catch of PBF is closely monitored by 100% scientific observer's coverage on board all the fishing activities (both a national and IATTC observer programs). All information is reported and shared between observer programs and based on the quota and catch amount information is reported daily to Mexican authority and IATTC to ensure a quick response from managers and timing of the closure season. All catch is within catch limits established in current IATTC resolution C-21-05.

### 2.5. Research

Since 1998, the INAPESCA and the PNAAPD have also organized an annual scientific meeting in Mexico to review the research activities developed by Mexican and other scientists. These studies are related with tunas, large pelagic and other oceanic species. Available information of those scientific meetings could be obtained directly from the authors listed in the journal "El Vigia"

of the PNAAPD (see [www.fidemar.org](www.fidemar.org)) that lists the presentation abstracts of every yearly meeting. That information is not a complete list of all research performed in Mexico related to those fishes and fisheries.

In relation to Close Kin program, Mexico is still collecting tissue samples. Starting 2016 and up to 2023. The size of the annual sampling program size from start was 750 tissues collected and from 2018 to 2022, 420, 755, 630, 455 and 460 samples have been collected respectively.

## 3. REFERENCES

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## 4. ACKNOWLEDGEMENT