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MEXICAN NATIONAL REPORT TO THE 22ND ISC

Instituto Nacional de la Pesca y Acuicultura (INAPESCA) and FIDEMAR

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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 Acuicultura, INAPESCA, Formerly INP), was created more than fifty 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 established 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 assesment 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.

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 I). 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 2).

Table 1. 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

Table 2. 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	3266
2021	108043	7995	0	3026

*this amount includes 245 tons of PBF released alive

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 where PBF is to be found. The fishing season has shifted from May-June to the first quarter in recent years (2019-2021).

The time series of bluefin tuna captured by the Mexican tuna purse seine boats from 2005-2020 is presented in Table 2. This catch represents only a very small proportion of the total tuna caught by the Mexican. 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 incidental. However, more recently, in the 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 U.S. sport fishery that operates in Mexican EEZ that is reported by the US.

Effort

There were 40 sets made in 10 trips focused on PBF for farming in 2020 and 38 sets in 10 trips also in 2021.

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, basically 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.

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.

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) 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 2021. The size of the annual sampling program size is about 750 PBF tissue collected.

SHARKS

At the end of 2021 the Mexican Delegation of the ISC Shark Working Group collaborated in the formal stock assessment of the North Pacific blue shark, *Prionace glauca*. We participated in the SHARKWG virtual workshop for the data preparation of the blue shark that was conducted from November 9 to 19, 2021. Mexico presented the annual catch data of blue sharks from the Mexican Pacific for the period 1976-2020, also provided the size data of 3,421 blue sharks documented by observers on-board of Mexican commercial longliners during the period 2018-2020. In the workshop also was presented the update of the blue shark abundance index in Mexican waters, as a working paper entitled "*Update on standardized catch rates for blue shark (Prionace glauca) in the 2006-2020 Mexican Pacific longline fishery based upon a shark scientific observer program*". At the beginning of 2022, the Mexican Delegation participated in the two virtual workshops, first one, the blue shark pre-assessment workshop that was held from March 1 to 4, 2022 and second, the final blue shark assessment workshop from March 25 to 27. April 2022. The final report of the North Pacific blue shark stock assessment was completed in June 2022.

Mexican Blue Shark Catch

For this new stock assessment of the blue shark, Mexico updated its historical series of annual catches incorporating the years 2018, 2019 and 2020, which were provided by the Mexican administrative fisheries authority (CONAPESCA). The total historical blue shark catch provided by Mexico cover the period of 1976-2020. The blue shark is the shark species with the highest catches in volume and number of individuals reported in the Mexican North Pacific (Castillo-Geniz 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 (Fig. 1). In

the following years, there has been a decrease in annual catches, reaching 3,533 t in 2020. 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, the Mexican Delegation considers that this decrease is more related to the oceanographic phenomena of ocean warming that have been observed in recent years in that region that a direct effect of the fishing effort (Godínez-Padilla, et. al 2022).

Mexican shark catch statistics by species were not available until 2006, so past blue shark catches have 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. And 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). For the following period of 2006-2020 were used official statistics that report specifically blue shark catches provided by CONAPESCA (Sosa-Nishizaki and Castillo-Geniz, 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%.

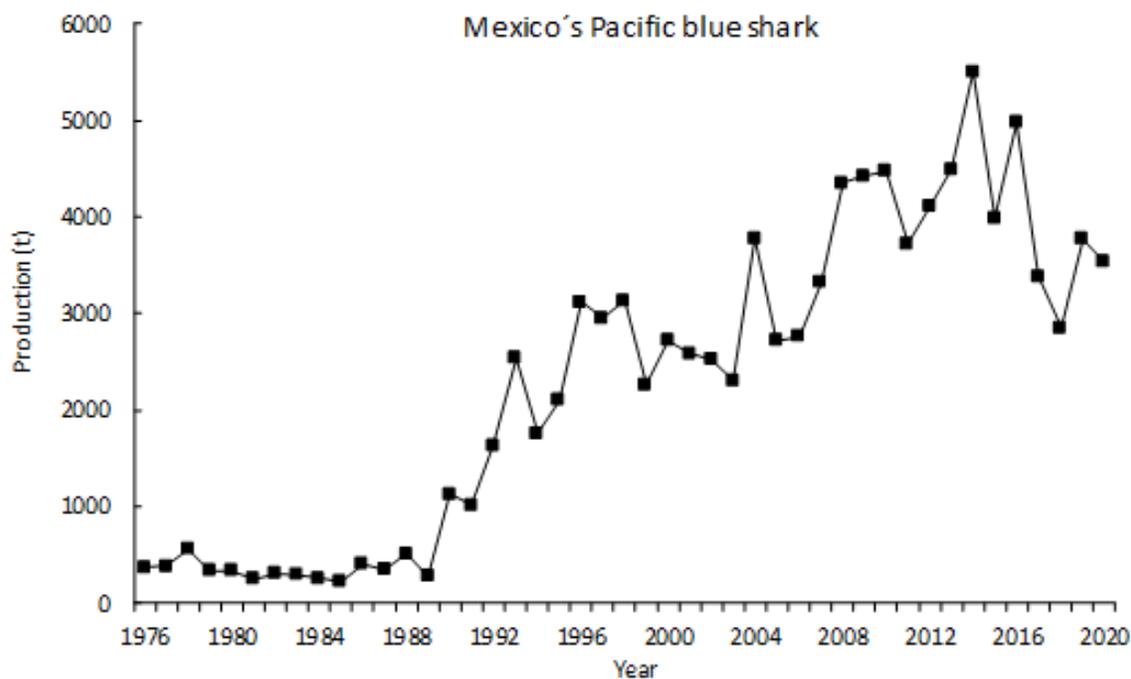


Figure 1. Historical series of annual blue shark catches in the Mexican Pacific for the period 1976-2020. Sources: 1976-2014 Sosa-Nishizaki and Castillo-Geniz, 2016; 2015-2020 CONAPESCA.

Table 3. Historical series of annual catches of blue shark reported by State in the Mexican Pacific period 1976-2020. Sources: Period 1976-2014 Sosa-Nishizaki and Castillo-Geniz, 2016; Period 2015-2020 CONAPESCA.

Year	BC	BCS	SIN	NAY	COL	TOTAL
1976	25	291	28	7	22	374
1977	14	315	28	9	19	386
1978	14	467	31	25	25	561
1979	17	194	41	64	23	338
1980	32	193	7	61	44	336
1981	44	87	24	66	35	256
1982	71	139	23	43	29	306
1983	63	143	18	27	42	293
1984	41	105	20	18	79	263
1985	15	140	16	17	40	227
1986	31	203	13	28	131	407
1987	54	244	16	14	23	351
1988	63	402	12	12	20	509
1989	34	157	12	22	55	280
1990	212	450	17	22	429	1,130
1991	149	404	16	22	424	1,016
1992	276	668	15	19	659	1,636
1993	938	770	141	15	676	2,540
1994	827	486	74	17	352	1,758
1995	572	778	48	19	682	2,100
1996	825	813	96	16	1,367	3,117
1997	925	651	120	11	1,241	2,948
1998	1,241	546	82	19	1,247	3,134
1999	792	1,082	149	21	218	2,261
2000	1,404	908	193	48	166	2,719
2001	1,612	665	116	33	162	2,587
2002	1,552	566	170	28	207	2,524
2003	1,445	438	242	23	158	2,307
2004	2,265	611	694	37	175	3,781
2005	1,420	670	455	21	155	2,721
2006	1,474	622	551	17	102	2,765
2007	1,774	776	554	13	207	3,324
2008	2,088	1,171	812	57	227	4,355
2009	2,438	949	779	48	209	4,423
2010	2,206	1,523	540	93	107	4,469
2011	1,810	1,228	477	47	157	3,719
2012	2,078	1,242	501	36	251	4,108
2013	2,474	996	365	378	282	4,494
2014	2,333	921	1,719	145	383	5,502
2015	2,117	376	1,142	47	303	3,985
2016	2,289	1,142	293	961	288	4,973
2017	1,537	303	1,183	45	316	3,384
2018	1,340	173	864	203	272	2,852
2019	1,585	557	1,035	306	289	3,772
2020	1,565	756	865	77	270	3,533

Blue Shark Abundance Index

Abundance indices for blue shark (*Prionace glauca*) in the northwest Mexican Pacific for the period 2006-2020 were estimated using data obtained through a pelagic longline observer program. Individual longline set catch per unit effort data, collected by scientific observers, were analyzed to assess effects of environmental factors such as sea surface temperature, distance to the nearest point on the coast and time-area factors. Standardized catch rates were estimated by applying generalized linear models (GLM). Sea surface temperature, mean SST anomalies, distance to the coast, year, area fished, quarter and fraction of night hours in the fishing set were all significant factors included in the model. The results of this analysis show a relatively stable trend with a sharp descent in the last year of the time series in the standardized abundance index in the period considered (Fig. 2). This trend could be explained in terms of recent oceanographic events and possible recent changes in fishing strategy of the fleets involved.

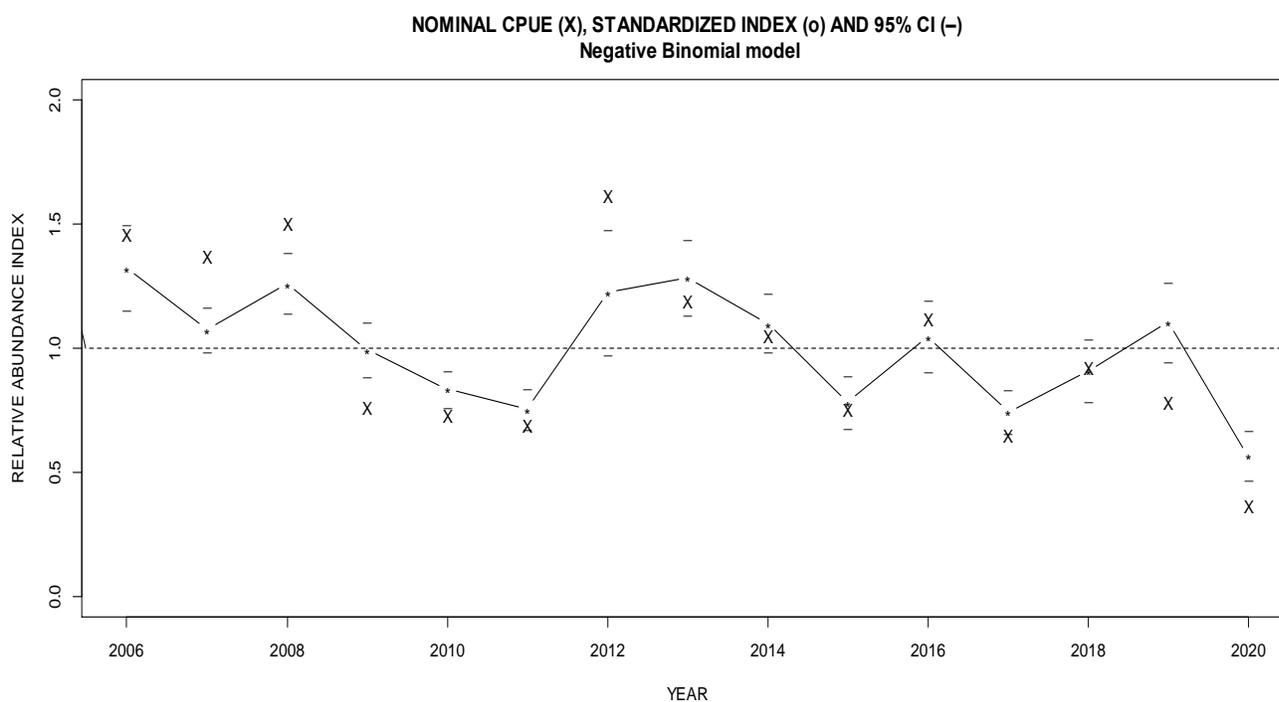


Figure 2. Relative abundance indices for the blue shark with approximate 95% confidence intervals. Negative Binomial model for years 2006-2020.

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