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National Report of Mexico[1]

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INTRODUCTION

Mexico has been participating since the first meeting of the ISC and in 2004 Mexico joined this organization formally at its 4TH annual reunion in Honolulu, Hawaii, U.S.A. During those years Mexico has been reporting fishery statistics to ISC. Before joining the ISC and until the present, Mexican fishery statistics have been provided regionally to the Inter American Tropical Tuna Commission (IATTC) and also shared with other international fisheries management bodies to which Mexico is a fully cooperating Party.

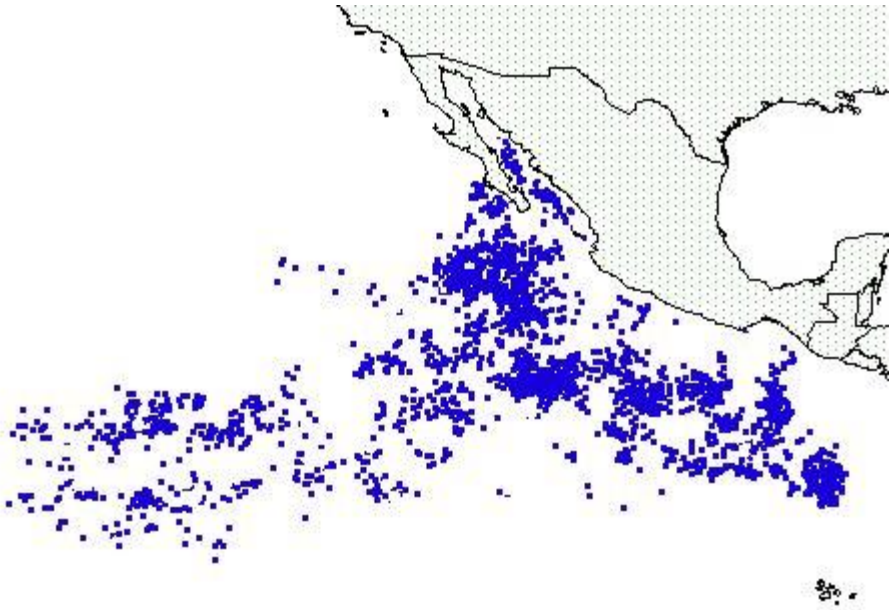
This national report describes the recent trends and updates the Mexican tuna fishery for the yellowfin, bluefin, albacore tunas, swordfish and sharks.

In Mexico, the National Institute of Fisheries Instituto (INAPESCA, formerly INP), was created more that fifty years ago to systematically conduct scientific work and fisheries research with the marine resources of Mexico. The INAPESCA is responsible for provide the scientific bases for the management advice to the fisheries authorities in México (CONAPESCA) and poses along its coastal states, in both, Pacific and Gulf of Mexico, 14 regional fisheries centers (CRIPs) which are the local centers and laboratories in charge with the recognition, data collecting, sampling and monitoring 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), which closely monitored 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 groups.

Tuna fisheries in the Eastern Pacific Ocean

The Mexican fleet concentrates mainly in the yellowfin (Thunnus albacares) in the EPO, which is the prime target tuna species. The Mexican tuna purse seine fishery is one of the largest in that region since the mid 1980's, although recently it has been displaced to second considering all catches of tunas. This tropical tuna represents for its large volumes the main component in the total catches. 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 and the albacore (Thunnus alalunga).

Fishing operations of the Mexican purse seine fishery comprise a vast area in the EPO, (figure 1). That also shows the magnitude and distribution of the typical types of purse seine sets (sets associated with dolphins, or logs and unassociated sets)



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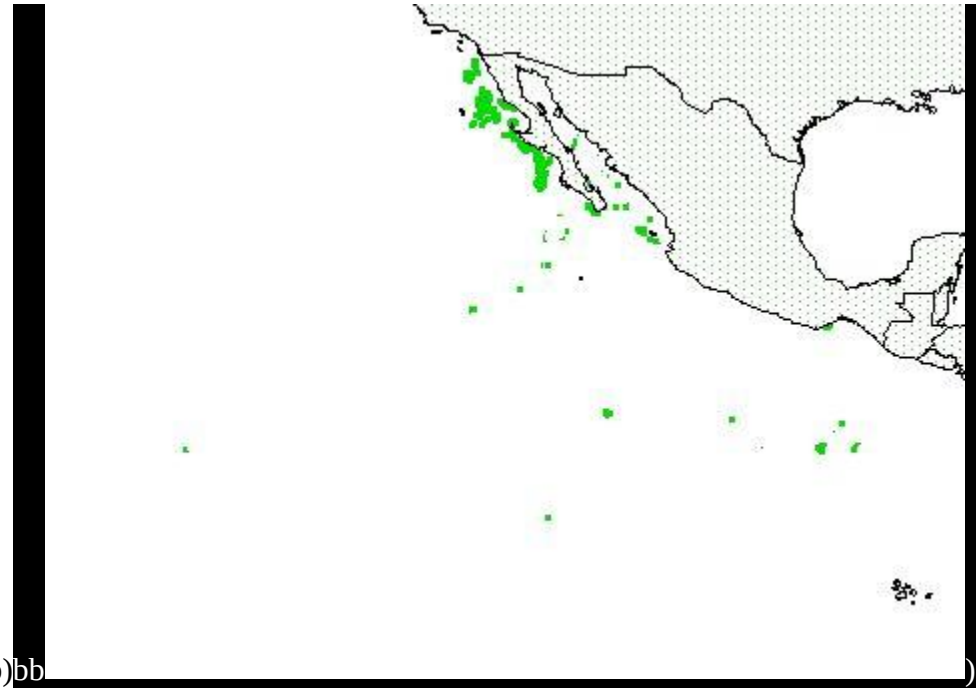

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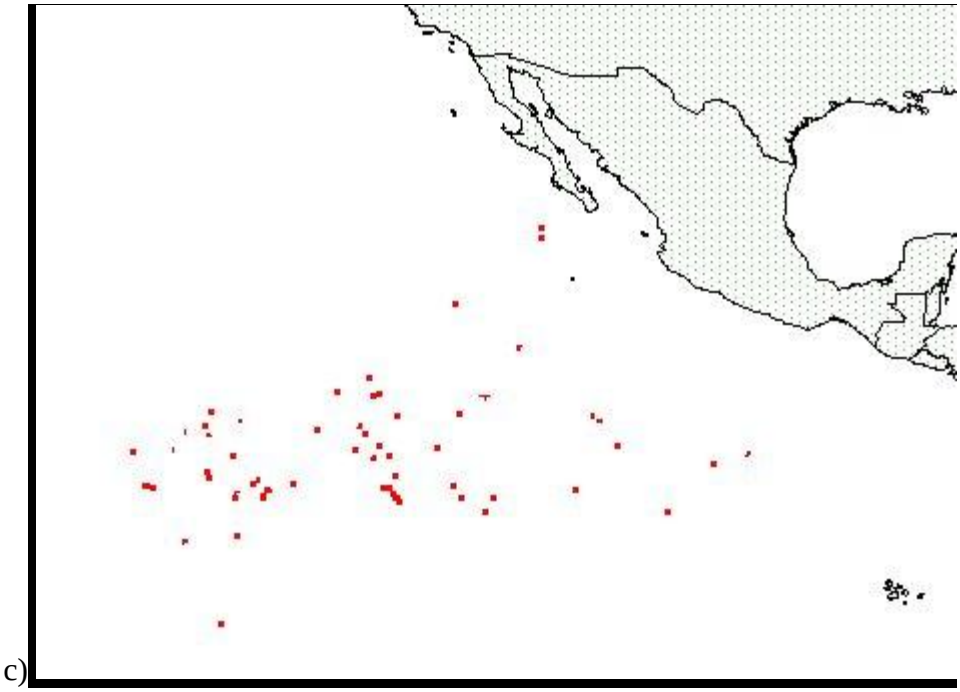


c)

Figure 1. Fishing grounds of the Mexican purse seine fishery (a dolphin sets, b) free swimming schools, c) log sets). 2012

The recorded levels of tuna captures in the EPO zone by the Mexican fleet from 1980 till 2012 are shown in figure 2.

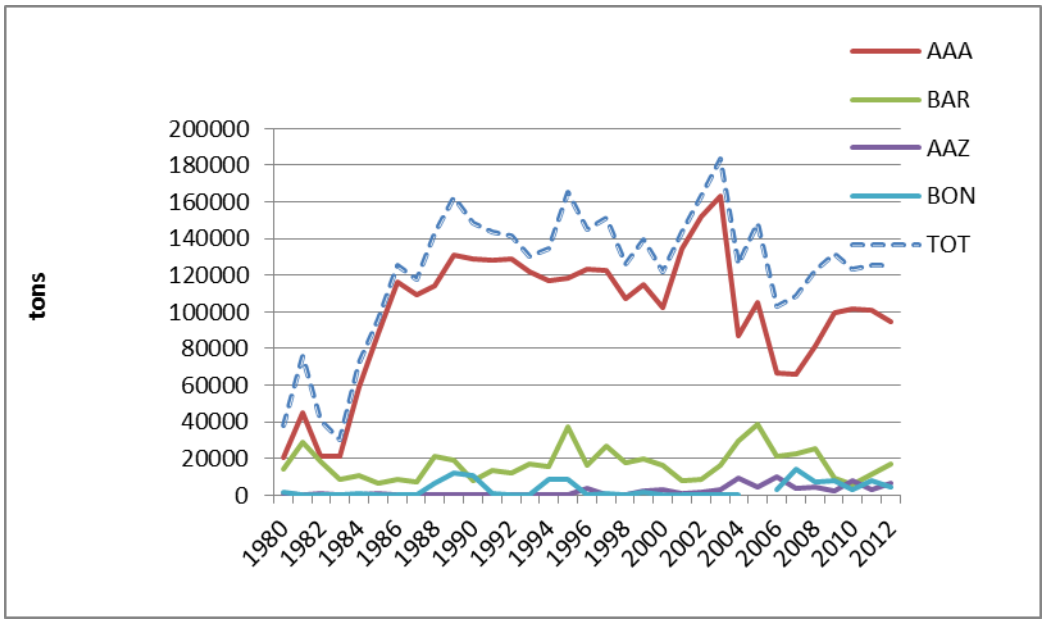


Figure 2. Mexican tuna catch of yellowfin tuna (YFT), skipjack (SKJ) and bluefin tuna (BFT), 1980-2012.

The total tuna landings of Mexico in 2003 were 18,3199 mt. which represents the highest historic record for this fishery. Comparatively, the lowest recorded capture during recent years was in the 2006 season, with only 10,2472 mt., value which is closer to the 1980's development phase. During the last year catches of yellowfin tuna continue to increase slowly. The fleet has compensated partially its catches with skipjack and other tuna species.

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. This is 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 south of the Equator.

The Mexican purse seine fleet is subdivided in three parts: purse seine vessels greater of 400 m^3 which all carry observers on board in 100% of all their trips and a portion of smaller than 400m^3, which are not required to have observers. Besides those two there is a small quantity of pole and line vessels (Table I). The Mexican tuna fleet has been quite stable in number, composition and carrying capacity since the 1990´s.

Yellowfin tuna always has been the primary catch and skipjack is the second in volume. Other tuna species have sharp values because the fleet has compensated in some years lower yellowfin catches with other tunas, basically black skipjack; but since 2001 a slight increase is related also with bluefin tuna catches, (Table 2). This information reflects the great importance of the yellowfin tuna in the Mexican catches and the secondary level of all the other tuna species in the total catches obtained by this fleet in the ETP.

Table 1. Total landings, size, composition and carrying capacity of the active Mexican tuna fleet 2007 to 2012

YEAR	No. of active tuna boats	No. of m PSeiners > 400 m^3	No. of PSeiners ≤ 400 m^3	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	41	0	2
2012	45	42	0	3

Table 2. Total tuna landings and the proportions of the different tuna species in the Mexican fishery from 2005-2012

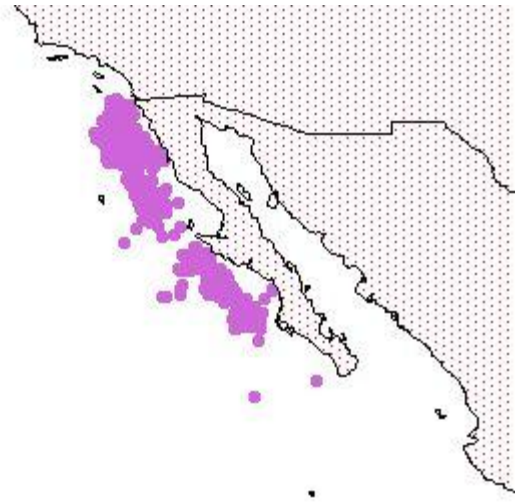
YEAR	TOTAL LANDINGS All tuna species (mt.)	Yellowfin (mt	Skipjack (MT.)	Others Species (mt.)
2005	**152364**	**113279**	**32985**	**6100**
2006	**102472**	**68644**	**18655**	**15173**
2007	**108351**	**65834**	**21970**	**20547**
2008	**122568**	**85517**	**21931**	**15111**
2009	**123750**	**99157**	**9310**	**15243**
2010	**120679**	**101523**	**6090**	**13066**
2011	**124902**	**102887**	**8600**	**13405**
2012	**127135**	**97086**	**14713**	**15336**

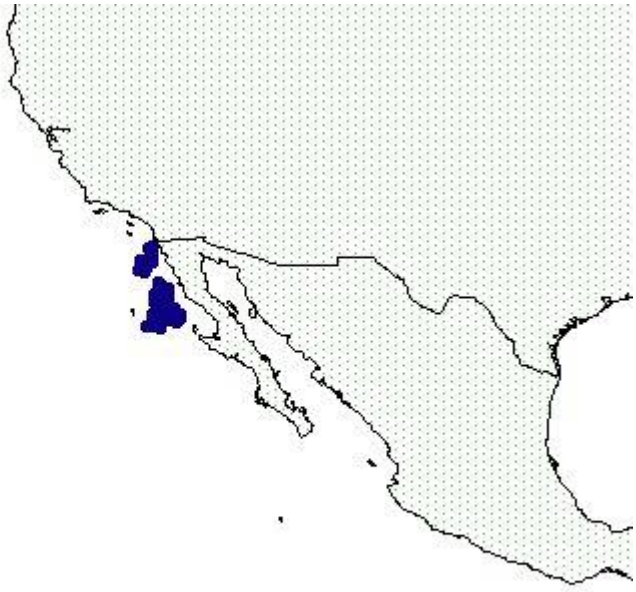
1) Other species are: albacore (T. alalaunga), bluefin (T. orientalis), bigeye (T. obesus) and the black skipjack (Euthynnus lineatus). *2012 data is preliminary.

Bluefin tuna

All the fishing zones for bluefin tuna used by the Mexican fleet are located closer to the ranching locations in the Northwest side of the Baja California peninsula, inside the ZEE of Mexico (figure 3). The fishing season usually runs five months, from May to September, which is the time in which the transpacific migration of this stock is closer to the Mexican Pacific coast, due to oceanographic factors. In 2006 the fishing season started earlier, in March. 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.

a)





b)

Figure 3. Fishing Zones for bluefin tuna in the Northwest region of Mexico, offshore the Baja California peninsula, a) 1992-2006 and b) during 2012

The time series of bluefin tuna captured by the Mexican tuna purse seine boats from 2001-2012 is presented in Table 3 to see the period related to ranching activities that started in 1996 and fully developed since 2001. This catch represents only a very small proportion of the total tuna caught by the Mexican fleet with an average catch of 4825 mt for this period. This represents a small proportion of the Mexican tuna catch, although very valuable. The 3,700 mt. 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 and in 2012 catch should be around the level of catches are expected to be around 3,000 t, given the conservation measures adopted recently in the IATTC. 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 for many years 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.

Table 3. Bluefin tuna catch of Mexico, 2001-2012*. (*preliminary)

2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
863	**1710**	**3254**	**8894**	**4542**	**9927**	**4147**	**4407**	**3019**	**7746**	**2731**	**6668**

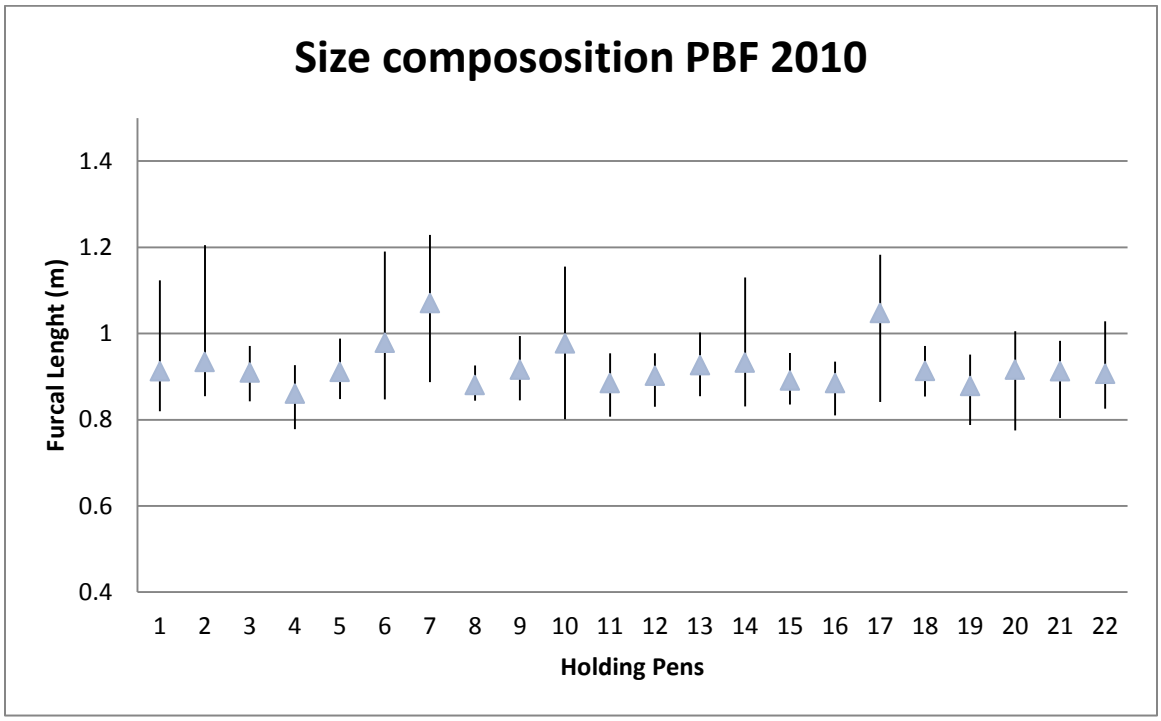
The catches of bluefin for ranching are performed only with commercial purse seiners carrying observers (normally searching for YFT) and transferred to fattening nets located in the Baja California peninsula.

There is also a USA sport fishery that operates in Mexican EEZ. These data is reported separated by the USA.

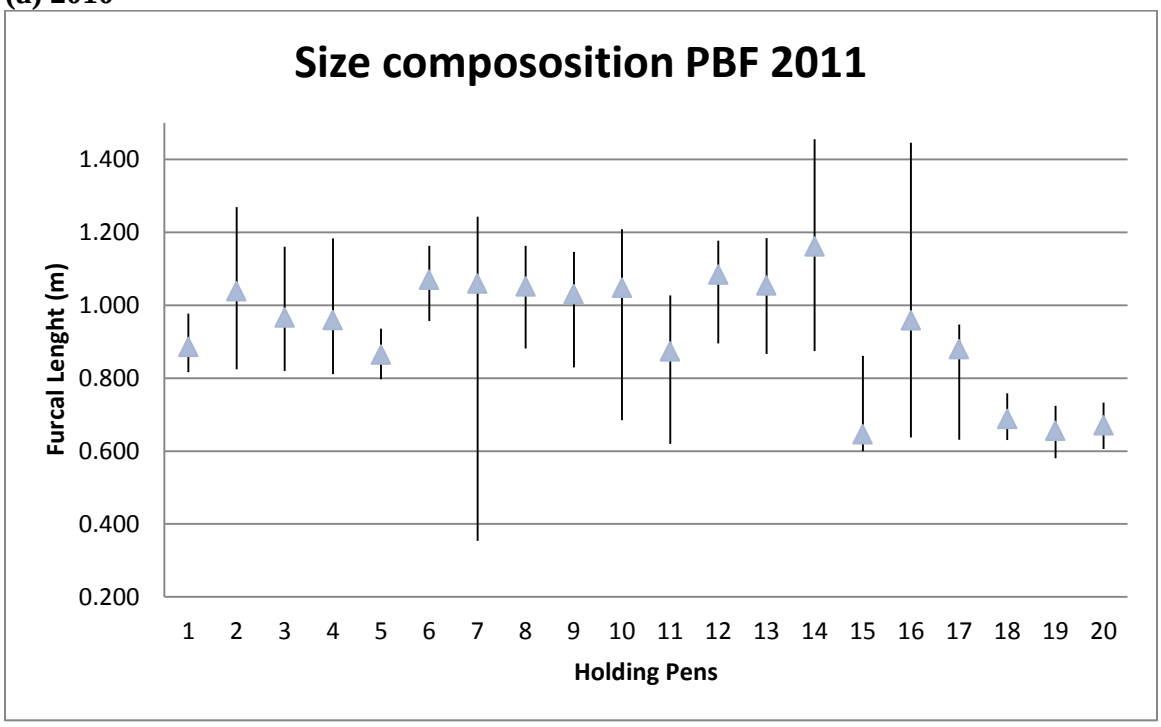
Tuna Ranching Activities

This new tuna fishery component (farming) has been as explained, the trigger of higher proportional catches of Bluefin. Record catches have been registered in 2004, increasing again in 2006 and 2010 and 2012. Most of the catch is utilized for fattening. 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 2007, 2008 and 2009 almost all BFT was directed to ranching. This activity represents an economic incentive for the Mexican tuna fishery and has a regional economic impact especially in that region of Mexico. However, the ranching activities are limited in several ways. They depend on the fishing vessels already involved in tuna fishery, by the amount of area they have committed for aquaculture purposes and by law, defining in many cases the amount the companies can growth each year. Also for these activities the prevailing oceanographic conditions near the ranching zones are a key factor.

The range size composition of the PBF in 2010 and 2011 is presented in figure 4, and was accessible and analyzed within the ISC-PBFWG in Hawaii meeting last year. This data was originated with the stereoscopic camera software giving accurate information on size composition of the bluefin tuna devoted to ranching. Mexico will have 2012 data in the near future that will be shared again with the ISC-PBFWG.



(a) 2010



(b) 2011

Fig. 4. Size composition of the bluefin tuna caught for the holding pens in 2010 (a) and 2011 (b).

Management

In the case of the Bluefin tuna fishery there are management conservation measures implemented in the EPO by the IATTC, starting 2012 for all commercial fleets. Recently in June 2013 a new conservation measure for this tuna species has been adopted for 2014 also. At the national level there is also a recommendation to catch bluefin tunas for ranching of 12 kg and above, besides some restrictions which have been implemented in relation to fishing permits.

Albacore (T. alalunga)

The related Mexican information for this fishery has been reported constantly to ISC-GWALB and the IATTC. As with the bluefin tuna, catches are limited only to a small area in northern Mexico (figure 5). Table 4 shows the total catch reported for Mexico from 1980 to 2012.

Figure 5. Albacore fishing ground for the Mexican purse seine fishery.

Table 4. Mexican albacore tuna catches from 2000-2012. *2012 data is preliminary

YEAR	MEXICAN CATCH
2000	103
2001	18
2002	28
2003	29
2004	104
2005	0
2006	109
2007	40

2008	**10**
2009	**17**
2010	**25**
2011	**0**
2012	**0**

Besides this, the Sport Fishing Association of California also cooperated gently with information of their annual catches of albacore by their commercial passenger fishing fleet operating under permits in Mexican north Pacific zones. This represents a valuable piece of new information that was provided in a previous report. No new information is provided in this Mexican report but the USA provides the catch data since the vessels depart and return to USA ports.

Shark fisheries in the Mexican Pacific

The seasonal abundance of diverse shark species along the coastal and oceanic waters of the Mexican Pacific, including the Gulf of California has been reported before to the ISC-GWS and now it is complemented with the development of artisanal and pelagic shark fisheries along the Pacific coastal states of Mexico.

The main regions for shark fisheries are the Gulf of California, Gulf of Tehuantepec and the west coast of the Baja California peninsula. Shark fisheries in Mexico provide valuable sources of food, employment and profits for local and regional economies, some of which have a comparative lower economic level. In terms of production, the national shark fishery occupied in 2010 the eighth place nationally, with 29,774 t and the seventh in terms of economic value (SAGARPA, 2011). Shark meat (national human consumption) and fins (international trade) have been the principal products obtained from several shark species. Several Mexican fisheries target sharks directly and in other pelagic fisheries represent a by-catch. The principal shark fisheries in the Mexican region are: 1) the longline fishery of Ensenada, Baja California, 2) the longline shark fishery of Mazatlán, Sinaloa; 3) the longline shark fishery of Manzanillo, Colima and 4) diverse gillnet and longline artisanal fisheries along the coastline of the Mexican Pacific. From which, the most extended is the Chiapas shark artisanal fishery. With the exception of the northern region of the Pacific, the shark fisheries in the Central and southern Pacific, including the Gulf of California, have been sustained by tropical shark species, specially carcarhinids.

The National Fisheries Institute of Mexico (INAPESCA) has conducted since 1960's, scientific and technological research on shark fisheries in both Pacific and Gulf of Mexico waters, providing the scientific bases for management advice to the fisheries authorities. In 1993 the Ministry of Fisheries considering the results of a regional artisanal shark study conducted by the INAPESCA (Rodríguez de la Cruz *et al*., 1996; Castillo-Géniz *et al*., 1998), set up a moratorium on the issuing of new commercial shark permits, with the objective to stop any increase in the fishery effort. That moratorium was extended later in 1998 to the industrial shark fisheries (Castillo-Géniz *et al.*, 1998). Several other actions have been made to manage shark fisheries in México; by example, in response to the International Plan of Action for Conservation and Management of Shark (FAO-IPOA-Sharks), a National Plan of Action (PANMCT) and a

national management legal instrument was developed (NOM-029-PESC-2006, CONAPESCA-INP 2004, SAGARPA DOF 2007). This new law limits the type and use of shark fishing gears, prohibits as well shark finning and fishing in some specific areas, as the identified shark nursery ground in the Baja California whale sanctuaries, also near the main turtle nesting zones. The law states that catches of each species have to be reported in the ship's log books whereas in the artisanal shark fisheries, permit holders must submit statistical monthly summaries of their shark catches by species and numbers. Finally, the law gives total protection against catch for any reason to vulnerable species of sharks and rays (white, whale and basking sharks, and mobulid rays and sawfish). On top Mexico has decreed a pioneer closing season for its shark fisheries during two months during the summer.

Mexico's participation in the ISC Shark Working Group

During the 10th ISC Plenary, held in Victoria, B.C. Canada from 21-26 July 2010 the Plenary agreed to dissolve its Bycatch Working Group and created a Shark Working Group (SWG) in order to implement the recommendations of its Shark Task Force Group (STFG). The STFG noted that ISC member countries seem to have enough information for the stock assessment of key shark species in the North Pacific Ocean, especially blue and shortfin mako sharks. The STFG also noted that there was sufficient interest and expertise to conduct these assessments. Finally STFG prepared a list of key shark species captured on the NPO fisheries. The new SWG will be responsible for conducting stock assessment and other scientific studies as required. Therefore, the SWG is focussed on monitoring shark fisheries particularly blue, shortfin mako, bigeye thresher, pelagic thresher, silky, oceanic whitetip, hammerhead and any other shark species for which stock assessment may be needed. So far efforts have concentrated mainly in the blue and at this meeting the review of the short fin mako life history began.

Participation of Mexico's in the SWG can be summarized as following:

- In the ISC Shark Working Group Workshop held in Shimizu, Japan, from 18-March, 2011, Mexico participated submitting a working paper titled: *"Outline of new available catch and effort data of pelagic sharks caught by the Mexican shark longline fishery in the North Pacific"*, prepared by Tovar-Avila, J., González-Ania, L.V., Liedo-Galindo, A., Márquez-Farias, J. F. ISC/11/SHARKWG-1/8

- An INAPESCA shark specialist participated in the intercessional workshop (SHARKWG) of ISC held in La Jolla California, USA from November 28 through December 3, 2011. There, INAPESCA submitted a paper titled "*Swordfish and shark longline fishery of Baja California (Ensenada) Mexico, INAPESCA*", presented by José Leonardo Castillo-Géniz (ISC/11/SHARKWG-2/INFO-1).

- Japan is conducting a genetic analysis of blue sharks to estimate their stock structure and phylogeography within the Pacific Ocean using microsatellite and mitochondrial markers. Japan requested assistance from Mexico representative to collect genetic samples from blue shark and mako sharks from Mexican coastlines (Pacific and Gulf of Mexico).

INAPESCA accepted to collaborate in this effort providing to Japan genetic samples from these species but requested to Japan representatives the possibility that Mexican genetic specialists could be involve more actively in the project. In April 2012 INAPESCA sent to Japan 16 tissue samples from blue sharks collected from artisanal catches obtained from the Sebastián Vizcaíno Bay in Baja California. Last January 2013 during the intercessional workshop (January 7-14, 2013) of the SHARKWG held in La Jolla, California, USA, the INAPESCA representative delivered an additional 44 shark tissue samples (38 mako and 6 blue sharks) to the Japanese Delegates in support to the shark phylogeography projects.

- In April 14, 2013, INAPESCA's representative submitted to the ISC-SHARKWG Chairman, comments on the working paper (ISC/13/SHARKWG-1/04) titled "Estimates of Mexico's blue shark catch from 1976-2010" elaborated by Tim Sippel from SWFSC-La Jolla.

- In June, 2013, INAPESCA provided to the ISC-SHARKWG Chairman data on size structure of blue shark catches from Mexican longline pelagic fleets (Ensenada and Manzanillo fleets) that will be used in the blue shark stock assessment.

FISHERIES AND CATCHES

Historical trends

Mexico's shark catches have showed a typical historical trend similar to the other shark-fishing nations worldwide, following in some way the same phenomenon of "boom and bust fisheries", characterized by a rapid growth in catches and effort during a short period of time, followed by a fall in the catches. The precautionary measures applied by the Mexican government during the 90's and renewed more recently as explained above, have prevented the overfishing of shark stocks exploited in Mexican waters.

In Mexico shark landings have been reported in two major statistical nominal categories, "tiburón" for large sharks (>1.5 m or > 5 kg in weight) and "cazón" for small sharks (< 1.5 m or < 5 kg). (figure 6).

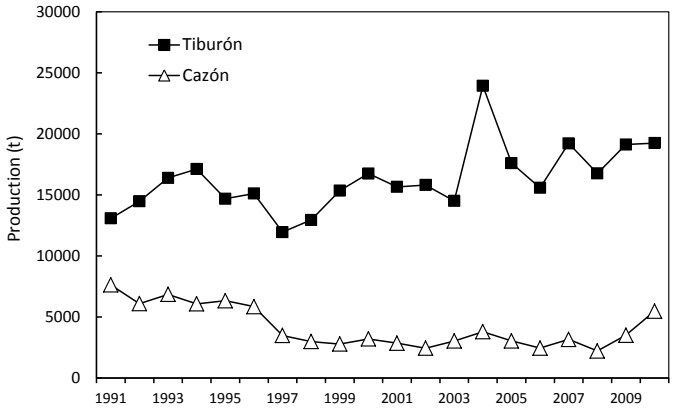


Figure 6. Mexico's Pacific shark production splitted by "Tiburón (large sharks) and "Cazón" (small sharks) generic categories of the period 1991-2010. Source: Mexican National Fisheries Statistical Yearbooks.

During the first "boom" of the Mexican shark fishery, triggered by the USA demand of Vitamin A obtained from shark livers during the II World War, the Mexican shark catches peaked near five thousand t, mostly from the northern Pacific region. Subsequently shark catches began to increase following the demographic grow rate of Mexican population and the demand for shark meat, which in some coastal areas is high. Therefore, in a short period the shark production almost quintuplicate. The first national historical shark production record for all the coastal zones in 1981, with 35,264 t, followed by the highest record in 1990: 36,737; in 1993 the shark catches were also considerably, 36,309 t. In the last decade (2000-2011) national and regional shark catches showed a steady decrease, particularly in the Gulf of Mexico. In the Pacific the highest shark production record was observed also in 1990 with 13,801 t; in 1993 the production reached 13,801 t. During 2000-2011 the Mexican Pacific average shark production (including small species) was 20,804 t; the lowest recorded capture, 17,545 t was in 2003, and the highest one was documented in 2004 with 27,728 t. In 2011 the total shark catches were 20,224 t in the Pacific (SAGARPA, 2012), (Table 5 and figure 7).

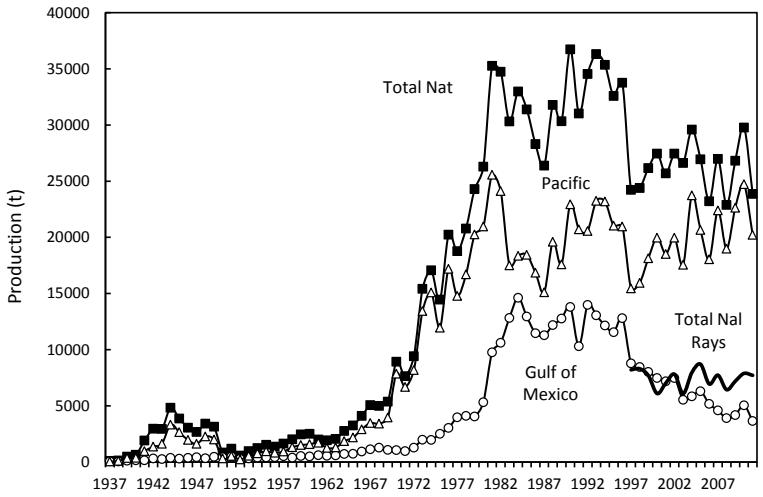


Figure 7. Historical Mexican national and regional shark production period 1937-2011. The shark total production showed is composed by the sum of the categories of large sharks (tiburón) and small sharks (cazón). Source: Mexican National Fisheries Statistical Yearbooks.

Elasmobranch landings from the four states bordering on the Gulf of California (Baja California, Baja California Sur, Sonora, and Sinaloa) averaged 15,367 t per year from 1986–2003, accounting for 41.7% of the national total (CONAPESCA, unpub.). The great majority of these landings were derived from the Gulf of California (Bizzarro *et al*., 2007). Important shark fishery grounds in the Pacific region (northern Mexico including the Gulf of California) have provided historically the largest shark landings. In the period 1991-2011 it accounted for 44.9% of the total national shark production.

The shark landings reported for the Pacific are composed mainly by two shark assemblages. In the northern Mexico, Pacific shark catches are sustained in large proportion by temperate shark species like blue, mako and thresher sharks, whereas in central and southern Pacific areas, shark catches are mainly composed by tropical carcharhinid sharks (Carcharhinidae), and hammerhead sharks (Sphyrnidae). In the Gulf of California shark fisheries target small sharks (cazones) as smoothhounds of genus *Mustelus*, angel sharks and a diverse group of batoids.

Along with the new national shark management legal instrument (NOM-029-PESC-2006), a scientific observer program began to operate in 2006 on board of the commercial shark vessels in the northern Mexican Pacific. This shark observer program (SOP) was technically designed by the INAPESCA and implemented by the National Program for Tuna Exploitation and Dolphin Protection (PNAAPD-FIDEMAR), who provided funds and experienced observers. The shark scientific observers operated in different fleets, based at the Mexican fishing ports of Ensenada (BC), San Carlos (BCS), Puerto Peñasco (Sonora), and Mazatlán (Sinaloa). The geographical and seasonal distribution, as well as the abundance (number of individuals) of shark species caught by the different fleets in northern Mexican Pacific were recorded by the PNAAPD observers. The data provided by the SOP during 2006-2011 include information of 280 fishing

trips and 5,353 sets (figure 8). From the total sets monitored by SOP 1,947 (36.5%) were carried out between 20° and 28°N. During this period 60% were gillnet sets, whereas 35% were longline sets.

Table 5. Mexican national total shark production by region, during the period 1991-2011. Production in metric tons (t). Source: Mexican Official Fisheries Statistics Yearbooks.

Year	Total National (t)	Pacific (t)	Gulf of Mexico (t)
1991	31018	20714	10304
1992	34543	20567	13976
1993	36309	23248	13061
1994	35355	23197	12158
1995	32575	21023	11552
1996	33755	20959	12796
1997	24220	15441	8779
1998	24383	15940	8443
1999	26164	18140	8024
2000	27443	19965	7478
2001	25695	18513	7182
2002	27443	19965	7478
2003	26610	17545	5535
2004	29580	23729	5846
2005	26948	20649	6300
2006	23205	18035	5170
2007	26984	22390	4593
2008	22877	18983	3894
2009	26807	22634	4173
2010	29774	24726	5048
2011	23867	20224	3643

Swordfish and shark longline fishery of Baja California (Ensenada)

The Mexican swordfish and shark drift gillnet fishery in the west coast of Baja California peninsula began in 1986. The fleet began with a small number of vessels (13), with lengths between 18-25 m. made of fiberglass or steel, with a capacity of 50-70 t.

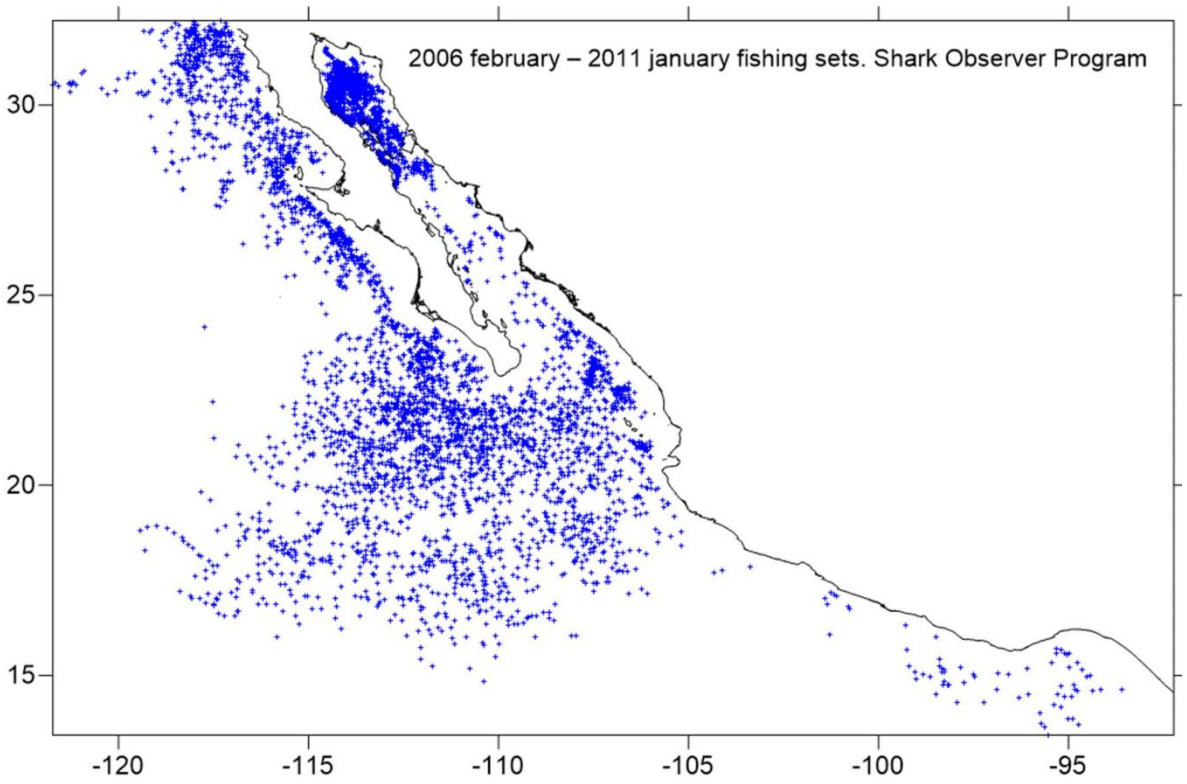


Figure 8. Spatial distribution of shark fishery sets in the Mexican Pacific EEZ during 2006-2011 (n= 5,353 fishing sets). Source: Shark Observer Program INAPESCA-FIDEMAR.

The percentage of the captures from the drift gillnet shark and sword fishery in 1990 was 85.5% swordfish, 11.2% sharks, 1.7% tuna-like fishes and 1.6% other. The shark by-catch composition included blue, thresher and mako sharks principally. Escobedo-Olvera (2009) reported a bycatch of 22 species in the swordfish gillnet operations during 1999-2008. In his analysis of 997 swordfish sets the most representative species were: blue shark (26.3%), pelagic thresher (14.2%) and mako sharks (12.1%). In 1998 as a result of an experimental fishing gear selectivity program conducted by INAPESCA, 9 gillnet vessels switched to surface longlines. As stated, in 2009 the NOM-029-PESC-2006 banned the use of gillnets in medium size commercial vessels in Mexican waters, measure which conducted the whole fleet to a 100% conversion to longline. Using the "administrative logbooks" ("avisos de arribo") and official logbooks in 2007 it was possible to estimate that the Ensenada fleet conducted 164 longline fishery trips, with an estimated total catch in weight of 1,500 t. The catch species composition was: blue shark 79%, swordfish 11%, thresher shark 5%, mako 3% and other species 2%. Table 6 reports the annual shark and swordfish catches of the Ensenada's fleet during 2000-2010.

During March 2006 to August 2008 the observer program monitored 97 fishing trips of the Ensenada and San Carlos fleets, reporting 1,025 sets, 124 were gillnet sets, 653 longline sets and 248 undetermined sets. A quarterly analysis of the catches from the fishery trips monitored by the observers indicated that blue shark, *Prionace glauca* dominated numerically through the year (Table 7). The largest catches were recorded during the first quarter (JAN-MAR) with 95.2%.

The three month period with less blue sharks was JUL-SEP with a total percentage of 85.6%. There is a marked seasonality in the captures of blue shark with the largest catches during the first and last quarters. Data combined from all quarters indicated a total contribution of 87.6% for blue shark and 1.8% for swordfish in the captures of the Ensenada's longline fleet. The spatial distribution of the fishery sets with positive captures of blue shark covered the latitudinal range 32°-20° N. (figure 9). This figure includes longline sets as well as gillnet sets. Gillnets were prohibited in 2009 by the NOM-029-PESC-2006. The largest catches of blue shark were documented in the northern area of the Baja peninsula.

Table 6. Ensenada's longline shark and swordfish production (weight) by year (2000-2010). Source: SAGARPA's Ensenada Fisheries Office.

Year	Sharks (t)	Swordfish (t)
2000	1090.3	601.5
2001	1448.5	515.5
2002	1730.4	214.6
2003	1230.1	237.1
2004	1127.7	268.1
2005	804.2	234.1
2006	838.5	327.9
2007	696.5	171.6
2008	840.4	241.9
2009	1306.5	393.8
2010	1797.3	221.9

Table 7. Captures in number of fish by quarter from the Ensenada's longline fleet during period 2006-2008 recorded by the shark observer program (INAPESCA-FIDEMAR)

Species	QTR 1	QTR 2	QTR 3	QTR 4	Total
Blue shark	32409	17899	7791	17468	75567
Swordfish	291	95	73	1124	1583
Other spp	1343	1154	4769	1807	9073
Total	34043	19148	12633	20399	86223

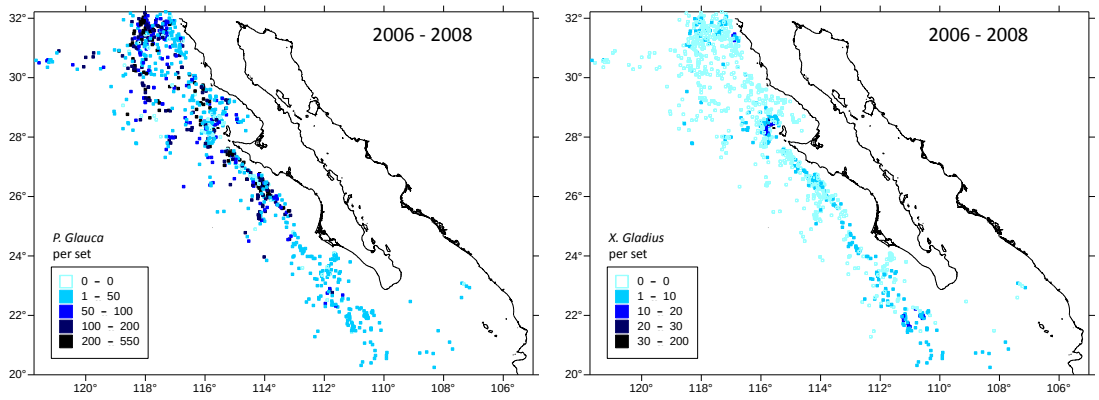


Figure 9. Spatial distribution of blue shark and swordfish fishing sets by the Ensenada's fleet monitored by observers during 2006-2008. Source: Shark observer program (INAPESCA-FIDEMAR).

CATCH AND EFFORT

INAPESCA during the last year has been compiling and reviewing CONAPESCA's fishery statistical instruments "administrative logbooks" and "fishery logbooks" from the shark fishery fleets with the objective to estimate the total shark catch and effort in terms of number of sharks by species and total number of hooks deployed in the principal shark medium-size fleets. It is a priority for INAPESCA to estimate such indices for blue, mako and silky sharks.

BILLFISHES

Mexico has been reporting on a yearly base till 2008 directly to the (BILLWG) of the ISC, since it was first convened in 2005. Each year, detailed information had been presented on the billfishes and swordfish fishery statistics from the sport fisheries activities developed in Mexico with this species. The aim of this contribution is to update and complement the information previously presented, with the most current data collected till 2011. This information is derived from the sport fisheries activities with billfishes developed in the Mexican Pacific Waters. These included an estimated retained catch from the total sport catches, since there is an average of 78.9% of release.

Data Sources:

The National Institute of Fisheries of Mexico (Instituto Nacional de Pesca, INAPESCA-México), has systematically monitored the recreational billfish for many years. This work has been routinely performed by several Regional Fisheries Research Centers, (Centros Regionales de Investigación Pesquera, also known as (CRIPS-INAPESCA). These regional centers are located strategically in areas along the northwest Mexican Pacific and in the Gulf of California. From north to South, the regional centers are known as: CRIP-ENSENADA and CRIP-LA PAZ, both in the extremes of the Baja California peninsula. The CRIP-GUAYMAS and CRIP-

MAZATLÁN are in the state of Sonora and Sinaloa, and the CRIP-BADEBA is situated in Nayarit (Fig. 10), in the Eastern coast of the Gulf of California. .

As reported in previous contributions, all the sport fishing trips are required by Mexican law to carry logbooks and specific forms, (NOM-017-Pesc-1994:D.O.F 9/05/95). Besides this, the INAPESCA scientists based at the listed CRIPS, regularly sample the fishing localities, piers, boat ramps, weight stations, and marinas, complementing with their direct observations, the data collection and the different data sources provided by the existing fleets. In contrast, the swordfish, which is the only billfish subjected in México to commercial catches, requires for the nature of its fishery to fill logbooks and special forms which are requested by the Mexican fishing authorities. This information is reported after each fishing trip to the local fisheries authorities of the Comisión Nacional de Pesca (CONAPESCA), working on the ports identified above in figure 10. Therefore, the commercial data here presented was collected by the cooperative work of the scientific personal from the regional CRIPS and the fishing authorities from the CONAPESCA.

Some of the information presented in this paper was published also before in the Carta Nacional Pesquera which constitutes one of the official national fishery data bases produced and reviewed seasonally by the INAPESCA-México. Other Information tabled was also previously offered in our sequential Progress Reports presented to the BILLWG. These are now complemented with the new data and the latest version of the (CNP-INP, 2006). In addition, in this report, we present the most current data collected and revised in 2008 to 2011 by the Sport Fisheries Monitoring Program, (SFMP-CRIP-LA PAZ-INAPESCA-Mexico). 2012 data still is under revision. As it was suggested by the BILLGW Group, to avoid confusions raised in the past with the Mexican data for the exciting high percentage of release, the information presented here covers only the estimated retained catches for billfishes.

Billfishes in Mexican Waters:

Six species of billfishes are recorded commonly in the Mexican Pacific waters. Given their relative abundances, the most important is by large the strip marlin (Tetrapturus audax). The other three marlin species which are present although in very small numbers are: the blue (Makaira nigricans), the black (M. indica) and the short bill spearfish (T. angustirostris). Besides these, the sail fish (Istiophorus platypterus), and the swordfish (Xiphias gladius) are also the other two billfishes species distributed in the Pacific side of México. As explained before, from those billfishes species found in México, only the swordfish is currently subject in some degree to some commercial catches and all the others are reserved totally for the recreational fisheries.

The sport fisheries activities along the Mexican Pacific coast are developed and concentrated in a specific designated fishing zone, which extends parallel to the Mexican Pacific coast, up to 50 nautical miles (nm) from the shore line. This area was officially established in 1983, as a reserve zone only for the recreational fishing activities, excluding the commercial catches (Diario Oficial, 1983). Later in 1987, for their relative importance, two other zones were established to complement the exclusion zones for the commercial operations. One is around the coast and tip of the state of Baja California Sur and the other, off the Gulf of Tehuantepec in the South of México (figure 10).

Along this extensive sport fishing area the marlin catches are basically concentrated mainly in three places. These sites are located on both sides of the entrance of the Gulf of California. The two more important, in terms of the numbers of sport trips and fish caught by year are: Cabo San Lucas and Buenavista, in the state of Baja California Sur (B.C.S), which are located at the tip of the Baja California peninsula. Undoubtedly, they constitute the prime sport fishing locations for billfishes on the whole Pacific coast of Mexico, accounting for almost 90% of the total billfishes caught every year. The corresponding 10% is from the other location, placed across the Gulf of California, at the mainland Mexico, in the port of Mazatlán, Sinaloa. In this report data from that area is presented untill 2011.

As explained above, besides the regulations with exempt most of the billfishes species present in Mexican waters for commercial fisheries operations since 1983. In 1995, the sport fisheries activities were ruled also by a specific new norm (NOM-017-Pesc-1994; D.O.F. 9/05/95). In our previous Mexican Progress reports presented to ISC, or those other contributions directly reported to the Marlin WG, such as: Ulloa, Fleischer, Dreyfus y Vaca (2004); Dreyfus, Fleischer, Robles y Ulloa (2005); Fleischer (2005): Fleischer, Dreyfus, Robles y Ulloa, (2006), Dreyfus, Fleischer, Klett , Ulloa y Robles, (2007), Dreyfus. Fleischer, Ulloa y Robles. (2008), we complemented the history of the billfishes management and regulations existing in Mexico.
Marlin species are also in some degree subject to incidental catches in some Mexican long line fishery or by the gillnets operations directed to sharks and the swordfish. Recently the Mexican Government issued the NOM-029-Pesc-2007, directed to regulated the shark fishery and therefore, to prevent further the by catch problem with the non-target species. At the present, there is still no reliable information on the incidental catches for the marlins derived from these two national commercial fisheries acting in the Mexican Pacific waters. However, as reported before, Macías-Zamora (1992) and Macías-Zamora, Vidaurri-Sotelo and Santana Hernández (1994) some reliable information related with the sail fish incidental catch in Mexican fisheries.
The swordfish, which is the only commercially targeted billfish, is also taken incidentally by the recreational fishery directed to the marlin species, although this occurs in very low numbers.

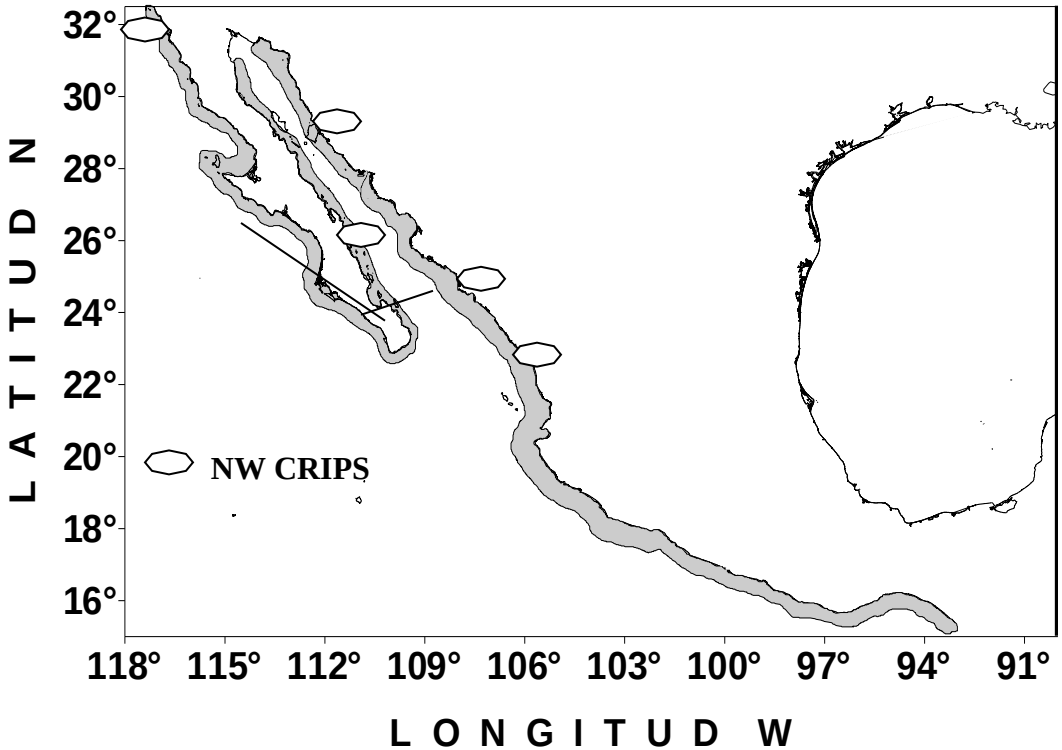


Fig. 10. Exclusive sport fishery zone of 50 nm miles from the coast, location of the two additional billfish protection zones in the Mexican Pacific and geographical position of the CRIPS-INAPESCA from the NW.

Estimated Retained Catches of Marlins from the Sport Fisheries in Mexico

Reported catch are the basis for the analysis used in the INAPESCA-CRIPS for this fisheries. Catch is defined as the number of fish caught. This includes the fish which is hooked and released, as well as, the fish which dies and are retained. The rate of catch/release in the Mexican recreational fishing zones reported by the different fleets combined is high. The estimated release average calculated was 78.902%. However, no data is still available at the present on the survival rates of the fish released by the recreational fishery Mexican waters. Recently, Domeier, Dewar and Nasby-Lucas (2003) reported a mortality rate of 26.2 % for the striped marlin caught with recreational fishing tackle used in Magdalena Bay in BCS, a locality which is not traditionally used for these activities. In this report we tabled for the first time, data on retained catch from the sport fishery encompassing the years 1990-2011, table 8.

Table 8. Estimated retained catch of billfisjhes in the Mexican catch and realease sport fisheryfishery, 1990-2011. Data for 2011 is preliminary

YEAR	MARLIN	BLUE MARLIN	SAIL FISH	BLACK MARLIN	SWORD FISH
1990	2610	319	2393	6	21
1991	3189	324	2126	7	8
1992	1996	706	1290	10	0
1993	2309	515	1272	16	1
1994	2337	360	1076	11	8
1995	2525	271	968	7	4
1996	3660	267	1137	5	4
1997	2805	159	1428	8	21
1998	4736	439	1531	9	10
1999	3472	496	1288	9	14
2000	4081	344	1630	13	16
2001	3262	329	796	8	9

2002	4189	370	696	3	1
2003	4424	244	947	10	4
2004	4966	256	1176	8	7
2005	7027	326	1099	8	8
2006	6118	273	557	13	3
2007	12318	181	507	5	3
2008	12581	115	836	2	4
2009	7515	151	560	3	1
2010	4575	215	384	8	3
2011*	3375	143	412	7	3

With the data provided it is evident in terms of their relative numbers, the clear dominance of the striped marlin with of the total catches, among the marlin species in the entire area. It is followed by the sail fish, then the blue marlin. Effort in terms of sport fishing trips in the main locations is presented in table 9.

Table 9. Total and average number of sport fishing trips at the three main sport fisheries locations at the Mexican Pacific coast: Los Cabos, Buenavista, B.C.S. and Mazatlán, Sin. Mexico, from 1990-20011.
***data from 2011 still is preliminary).**

YEAR	Los Cabos	Buenavista	Mazatlán	Areas Combined
1990	**13,589**	**9,276**	**8,649**	**31,514**
1991	**19,462**	**10,157**	**5,715**	**35,334**
1992	**16,576**	**9,127**	**4,320**	**30,023**
1993	**15,385**	**9,313**	**4,545**	**29,243**
1994	**14,845**	**9,961**	**4,421**	**29,227**
1995	**13,472**	**8,619**	**3,216**	**25,307**
1996	**15,315**	**9,365**	**4,368**	**29,048**
1997	**20,611**	**9,694**	**2,318**	**32,623**
1998	**23,501**	**8,106**	**3,321**	**34,928**
1999	**25,783**	**9,948**	**4,313**	**40,044**

2000	**28,211**	**9,555**	**4,074**	**41,840**
2001	**24,939**	**9,300**	**3,793**	**38,032**
2002	**27,618**	**12,909**	**3,828**	**44,355**
2003	**34,651**	**9,361**	**3,622**	**47,634**
2004	**32,780**	**12,522**	**3,554**	**48,856**
2005	**37,434**	**15,288**	**4,038**	**56,760**
2006	**40,888**	**11,408**	**3,679**	**55,975**
2007	**40,600**	**11,619**	**3,226**	**55,445**
2008*	**37,612**	**10,155**	**2,352**	**50,119**
2009	**33,452**	**7,829**	**2,019**	**43,300**
2010	**32,771**	**4,345**	**1,779**	**38,895**
2011	**31,883**	**5,672**	**NA**	**> 37,555**
AVERAGE	**26,426**	**9,706**	**3,864**	**39,929**

Biological Data (Category III Data):
Pick concentrations for the striped marlin in the Mexican Pacific zones have been correlated with sea water temperatures. This normally occurs from December to June, when the temperature is 22^{o} C to 25^{o}C (Howard and Ueyanagi, 1965). Also, Ortega-García et al. (2003), reported more recent, a similar range of temperatures from 22^{0}C to 24^{0}C. Other works, like Squire (1974, 1985 and 1987), have discussed the catch distribution of the marlin and its relationship with surface isotherm temperatures.

At the present there is some evidence of reproduction of the marlin in the Baja California waters. González-Armas, Sosa-Nishizaki, Funes–Rodríguez and Levy-Pérez (1999) confirmed the presence of marlin larvae in the entrance of the Gulf of California, from June to November. This finding was associated with warmer temperatures ranging from 27-8^{0}C to 31.5^{0}C. The study suggested that females have to stay in warmer waters because of its reproductive activity. Reproduction is also assumed to occur while migrating to the Pacific southern latitudes, during the months from July to October, (CNP-INP, 2004).

Ortega-García et al. (2003), reported the average lengths of marlin from Los Cabos area (B.C.S.). They sampled a data set with a total of 4,646 fishes caught from 1990-1999. From these, 2,524 (54.32%) were males and 2,122 (45.68%) females respectively. The average eye-fork length derived from this important regional study was 175 cm. The minimum size was recorded by them in 1996, with 167 cm and the maximum length reported in this study was 182 cm. significant length and weights differences were also found by these authors for males and females.

Similarly, the heaviest fish recorded on this data series (Loc. cit.) was reported in the spring. The Figure 9 (page 487) of that report, noted a lower number of fishes during the summer, but heavier females during this period were found. The sex ratio obtained in the cited study which

encompasses ten years of data was 1: 1.19, with more males landed, but they again noted that females were more frequent during the summer months.

Complementary to the published information on size and weights of the marlins caught at Mexico, we have given historic information on size composition for the billfish species (lower jaw to fork) of present here new information collected by the CRIP La PAZ-INAPESCA. These are presented in detail by species and by sexes. Size here reported is from lower jaw to forkand weight in kg.. This information is provided also to the Bilfish WG.

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