Research Article

Small-scale fisheries of lagoon estuarine complexes in Northwest Mexico

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Abstract

Small-scale fisheries of lagoon-estuarine complexes (LECs) in Northwest Mexico were investigated using official landings data. Species groups found in landings were clustered into three categories according to their life cycle and habitat distribution: Lagoon-estuarine (LE), Transition zone (TZ) and Coastal (CO). Average landings were highest for LE (19,606 t yr^{-1}), followed by TZ (7,234 t yr^{-1}), and CO (3,155 t yr^{-1}). In contrast, the total number of fished species groups had an opposite pattern: LE, TZ, and CO bore 31, 66 and 74 species groups respectively. The number of species groups in LE category significantly increased towards LECs of southern latitudes. The families with highest landings in LECs were Penaeidae, Portunidae, Mugilidae, Scombridae, and Lutjanidae. The area of LECs was significantly correlated with the amount of landings recorded for LE category. A similarity analysis of LECs species groups revealed a latitudinal clustering of northern and southern LECs. Overall, fisheries in LECs produced millions of $US per year, which support socioeconomic activities at the local, regional, and national scale. Although the information and landings data on LECs fisheries in Northwest Mexico have limitations for data analysis, our results suggest that changes in fisheries management of LECs, such as bottom-up management actions where resource users can participate, could help establish more sustainable fishing practices in these ecosystems and allow coastal communities to continue obtaining economic benefits and food supply from LECs in Northwest Mexico.

Key words: small-scale fisheries, fisheries revenues, mangroves, coastal lagoons, Gulf of California, Northwest Mexico

Received: 15 July 2015; **Accepted** 22 October 2015; **Published**: 28 March 2016

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Cite this paper as: Rubio-Cisneros, N.T., Aburto-Oropeza, O., and Ezcurra, E.. 2016. Small-scale fisheries of lagoon estuarine complexes in Northwest Mexico. *Tropical Conservation Science* Vol. 9 (1): 78-134. Available online: www.tropicalconservationscience.org

Disclosure*:* Neither Tropical Conservation Science (TCS) or the reviewers participating in the peer review process have *an* editorial influence or control over the content that is produced by the authors that publish in TCS.

Introduction

Small-scale fisheries worldwide account for more than half the world's catch, employ more than 90% of all people engaged in fisheries, and provide food security for hundreds of millions of persons [1, 2]. However, small-scale fisheries are frequently undervalued, seldom studied, and generally not taken into account by assessments or management programs [3].

In northwestern Mexico, small-scale fisheries generally use fiberglass skiffs known as "pangas" to catch diverse fish, shellfish, and invertebrates, which are found in varied ecological environments [4, 5]. However, some fishers of lagoons and estuaries in northwestern Mexico still employ more traditional fishing practices, such as manually throwing cast nets in shallow areas of LECs to catch shrimp and fish [6]. The Mexican National Commission of Fisheries and Aquaculture (CONAPESCA) reports that the Gulf of California harbors about 29,000 pangas officially registered for small-scale fisheries, 82% of which are found in the northwest Mexican Pacific coast, including the states of Sonora, Sinaloa and Nayarit, with 7,234, 11,828, and 4,442 pangas, respectively [7].

Northwestern Mexico's Pacific coast fisheries have been important for centuries [6]. Today, more than 50% of Mexico's small-scale and large-scale fisheries landings in this region are from inland water bodies connected to the sea such as estuaries, coastal lagoons, and bays [8, 9]. Here we define estuaries and coastal lagoons as lagoon-estuarine complexes (LECs) following Day and Yañez-Arancibia (1982) [10]. LECs are coastal ecotones connected to the sea in a permanent or ephemeral manner. They typically have shallow depths, variable volumes of water (depending on local climatic and hydrologic conditions), oscillations in temperature and salinity, muddy-sandy bottoms, seasonally high turbidity, and irregular topography. Primary production in the shallow waters of LECs (usually < 10 m depth) is sustained by nutrient inputs released by wind-induced sediment suspension [11, 12], and by the inflow of freshwater from rivers and their connection with the sea [13]. These ecosystems have very high primary productivity, usually ~10–15-fold higher than adjacent environments [14].

Few studies have systematically explored the small-scale fisheries of LECs. This is mainly because small-scale fisheries information is scarce and frequently reported inadequately [15-17]. For example, in Mexico, current fisheries statistics from CONAPESCA use coarse taxonomic categories that include multiple trophic levels, and landings data give no detail on fishing method or location of capture [18]. In spite of these limitations, CONAPESCA data currently represent the most complete and systematic information available for small-scale fisheries landings in Mexico. CONAPESCA fisheries data have proven useful in the development of macro-scale studies of the importance of mangrove forests for fisheries [21], and of fishery regions in the Gulf of California and northwestern Mexico [18].

Using CONAPESCA landings data and multivariate analysis, Erisman *et al.* (2011) demonstrated a connection between the spatial distribution of species groups of commercial fisheries landings and the latitude of primary coastal habitats of the Gulf of California, which include mangroves, wetlands, rocky reefs, and soft seabed habitats [18-20]. These results have been useful in the development of management plans that consider the direct spatial connection among coastal habitats, harvested species groups, and fishing activities within each fishery region [18].

Other studies, which also underscore the ecological and economic importance of LECs small-scale fisheries, show the Gulf of California produced more than 11,000 tons of fish and blue crab from 2001 to 2005 [21]. These fishery landings were dependent on mangrove forests in LECs from northwestern Mexico and the Baja California Peninsula, and were worth more than 19 million dollars in economic benefits for local fishers [21]. Carrasquilla-Henao *et al.* (2013) report that in the 1990–2009 period, volume captures of shrimp, blue crab, stripped mullet, snapper, and cockles of the San Ignacio-Navachiste-Macapule lagoon in northwestern Mexico were significantly correlated to mangrove cover [22]. In general, diverse physical, ecological and fisheries aspects of lagoon-estuarine ecosystems are more broadly reported in other coastal areas of Mexico, such as the Gulf of Mexico and the Caribbean, [see 23-25].

Overall, fishing in LECs of northwestern Mexico is focused on the Penaeidae (shrimp) and Portunidae (blue crab) families [6, 26]. The shrimp fishery is the most economically important in the studied LECs and occurs from September to March [27]. From April through August shrimp-fishing has been banned by the Mexican government since the early 1960s [6]. The blue crab (*Callinectes* sp.) fishery is considered second in economic importance in the region [26], and took place all year round until 2012, when fishing was banned from May to August of every year [28].

Regionally, little is known about how the fisheries of groups other than shrimp and blue crab occur in LECs of northwestern Mexico. More importantly, it is not known how these fisheries relate to the seasonality of the shrimp fishery. Although the fisheries of other species groups are not as profitable as those of shrimp (*e.g., Litopenaeus* spp.) and blue crab, they are important regionally, providing a continued flow of income and food resources for local communities. We examined how the landings of other groups caught in LECs may change with the seasonality of the shrimp-fishing season and whether these changes occur differently among LECs at different latitudes.

Our study provides a regional description of small-scale fisheries landings and their revenues in seven LECs of northwestern Mexico (see Table 1 for names), within one of the fishery regions proposed by Erisman *et al.* (2011). Our results can give managers a better understanding of LEC fishery dynamics, and can help in actions that aim to better understand the fising effort in the region for single species, such as shrimp or blue crab, and may also help to develop management actions for sustainable fishing and natural resource conservation of LECs in northwestern Mexico.

Methods

CONAPESCA landings database

We obtained a nine-year database (2001-2009) with 258,166 daily records of small-scale fishery landings from CONAPESCA headquarters in the city of Mazatlán. This information was compiled from 14 local fisheries offices (LFOs) in the states of Sonora (*n*=2), Sinaloa (*n*=9), and Nayarit (*n*=3), which were geographically associated with LECs. LFOs are located along the coastline at fishing towns, and all the official small-scale fisheries landings are compiled here by CONAPESCA personnel [18]. In order to assign the landing value reported from each LFO to a particular LEC, we used the geographic location (*n*=170) reported for each landing value in the CONAPESCA database and visually observed the location in the CONAPESCA atlas for landings locations in the states of Sonora, Sinaloa and Nayarit [29]. This allowed us to assign the landings values reported by each LFO to a certain LEC (Table 1, Fig. 1).

Fig. 1. LECs of Northwest Mexico. Coastal area of Sonora (SON), Sinaloa (SIN) and Nayarit (NAY). LECs are represented by colors: purple (Guaymas-Bahía Lobos GBL), orange (Huatabampo-Bahía Agiabampo HA), yellow (Topolobampo TOP), red (Bahía de Santa María La Reforma BSM), green (Pabellones PAB), pink (Mazatlán-Laguna Huizache Caimanero MLH), and magenta (Marismas Nacionales MN). Black circles with numbers represent local fishery offices from which landings arrival records were collected.

Classification of species groups in conapesca landings database

The small-scale fishery landings reports in the CONAPESCA database identified crustaceans, shellfish and fish by their regional common names, which can produce considerable variation in taxonomic specificity from a single species to a suite of species in the same genus, family, or class. We used FishBase and published reference materials to report the family and genus (when possible) [6, 30-32]. Further species groups were classified into three categories based on their life cycle and their habitat distribution as adults [30-32]: (1) Lagoon-estuarine landings are fish and invertebrates that inhabit the LEC during a single phase of their life history or for their entire lives, and are mainly fished inside the LEC. (2) Transition zone landings include fish and invertebrates that use the estuarine complex during just one

stage of their life cycle and whose main distribution is between the LEC and adjacent coastal waters. These taxa are fished both inside the LEC and in adjacent coastal areas. (3) Coastal landings include fish and invertebrates inhabiting coastal waters and mainly fished in coastal habitats adjacent to the LEC (Fig. 2A).

Table 1. Lagoon-estuarine complexes names and map labels.

Lagoon-estuarine complex (LEC)	CONAPESCA local fishery office	Local fishery office number in map
Guaymas-Bahía Lobos (GBL)	Guaymas	1
Huatabampo-Agiabampo (HA)	Huatabampo	2
Topolobampo (TOP)	Topolobampo, Mochis, and Guasave	3-5
Bahía de Santa María La Reforma (BSM)	La Reforma	6
Pabellones (PAB)	Navolato and Culiacán	7,8
Mazatlán-Laguna Huizache Caimanero (MLH)	Mazatlán and El Rosario	9,10
Marismas Nacionales (MN)	Escuinapa, Tecuala, Tuxpan and Santiago Ixcuintla	11-14

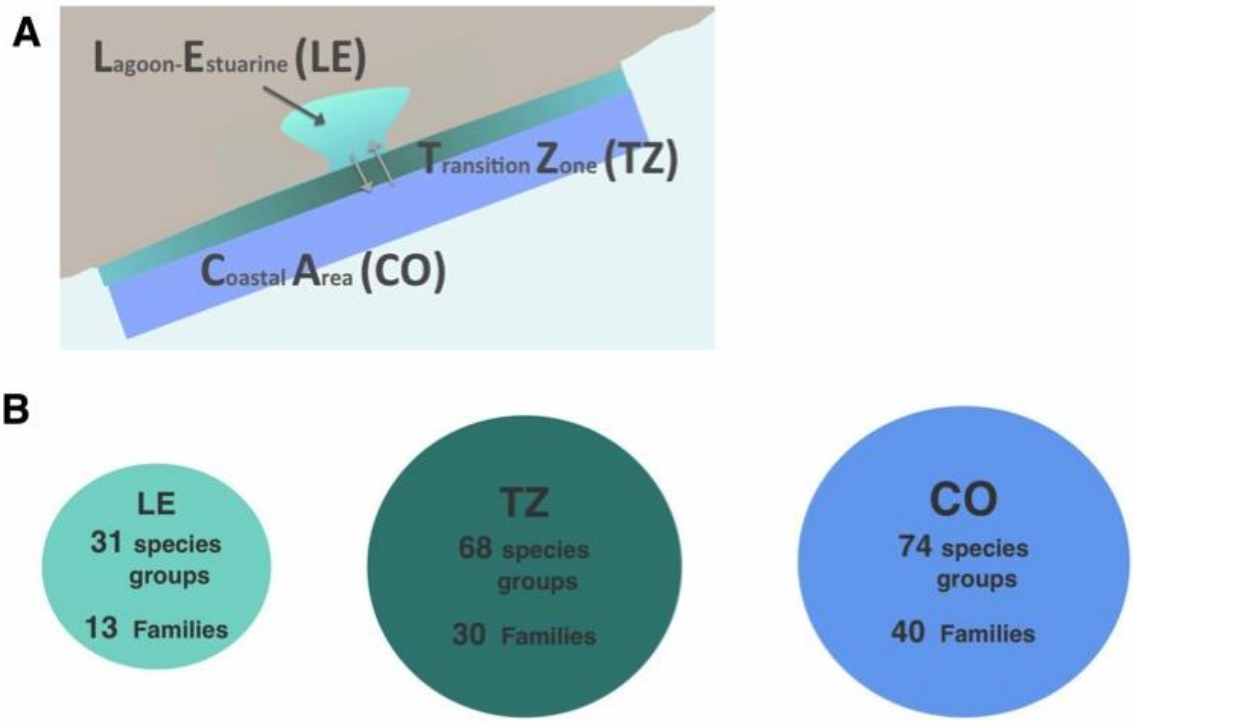

Fig. 2. (A) Diagram of the classification of species groups. (B) Number of species groups and families for each category. Circles are proportional to the amount of species groups in each category.

Data analysis

Families caught in LECs

We used descriptive statistics to identify the relevant species groups and their families caught in LECs. Families were considered relevant if their landings were within the 85% of the total catch for each species group category during the nine years of study.

Relationship between the landings of LECs and the number of species groups with the area and latitude of LECs.

We developed three hypotheses based on previous studies by: (1) Aburto *et al.* (2008), which show the area of mangrove fringe is positively correlated to fishery yields in coastal lagoons of the Gulf of California [21]; (2) Pérez-Rufaza (1989) and Pérez-Rufaza *et al.* (2006) which found that the positive relationship between species richness and lagoon volume, a synthetic expression of surface and depth, is consistent with the expectation that larger lagoons could provide a greater diversity of environments and types of bottoms with specific assemblages [16, 33]; and (3) Hillebrand (2004), which reports on the latitudinal gradient as a spatial pattern in taxa of aquatic and terrestrial environments where biodiversity is higher towards tropical latitudes and decreases towards higher latitudes [34].

Our first hypothesis was that mean annual landings for each family in each species group category in LECs would increase as the area of the LEC increases. The total area of LECs was used for the analysis, including mangrove cover (*Rhizophora mangle, Laguncularia racemosa, Avicennia germinans,* and *Conocarpus erectus*) together with the open water area of LECs, which also includes other submerged aquatic vegetation such as bottom-rooted seagrasses *(Ruppia maritima, Halodule wrightii, Syringodium filiformis, Zostera marina,* and *Thalassia testudinum*). Like mangroves, seagrass beds are also known to enhance fishery yields [35, 36]. Our second hypothesis was that the number of species groups would increase as the area of the LEC increases. Our third hypothesis was that the parameters of average annual landings and the number of species groups will vary depending on the latitude of each LEC. To test these hypotheses, four different relationships were tested via regression analysis: first, the area of the LEC in km^2 against (*i*) average annual landings and (*ii*) the number of species groups, and, secondly, the latitude of each LEC against these same factors.

Analysis of similarities of species groups among LECs

To determine whether species groups were similar among LECs, we used a non-parametric analysis of similarities, and a cluster analysis [37, 38]. For the non-parametric analysis of similarities, a presence–absence matrix of species groups as descriptors and LECs as units of the analysis was used. This test uses distance measures converted to ranks, and the test statistic R ranges from 0 to 1. A large positive R means dissimilarity between groups. If the non-parametric analysis of similarities revealed a significant *p* value <0.05, a step-down sequential Bonferroni post-hoc test was used to test for significant differences in LECs. The post-hoc test was done between the significant (*p* value <0.05) pairwise results of all gropus obtained from the non-parametric analysis of similarities; significant comparisons for the post-hoc test were at *p* value <0.05 [38]. For the cluster analysis PAST v. 2.12 uses unweight pair-group averages, where clusters are joined based on the average distance between all members in the two groups. The distance matrix for this analysis was made using the Bray-Curtis similarity index [38].

Testing for the causes of dissimilarities in fishery species groups among LECs.

To test hypotheses on the causes of dissimilarity between LECs, we used the same presence-absence matrices used for the non-parametric analysis of similarities for each fishery group category, and

subjected them to a Principal Component Analysis. The resulting axes were tested against external variables such as latitude or lagoon size, in order to detect potential drivers of the differences in fishery composition between LECs.

Average annual landings of families caught in northern and southern LECs

We obtained the average annual landings of each relevant family in northern and southern LECs in each species group category and used a one-way analysis of variance (ANOVA) to examine differences between the average annual landings of the same families from northern and southern LECs for each species group category. Calculations of fishing method or catch-per-unit were not possible to analyze from the CONAPESCA database since small-scale fishers are not required to submit detailed daily logs of fishing activities [31].

LECs fisheries during shrimp-fishing season and shrimp-fishing ban

We selected 19 species groups from the CONAPESCA database for which monthly landings were available, from the seven LECs studied. We hypothesized that (*i*) the amount of landings of the 19 species groups during the shrimp-fishing season (September-March) would be different from the amount during the shrimp-fishing ban (April-August), and that (*ii*) the landings of the 19 species groups will be different between northern and southern LECs depending on the season. To test these hypotheses we used a one-way ANOVA to analyze the differences of landings between fishing seasons, and a discriminant function analysis assessed the effects of fishing season in northern and southern LECs. Wilk's Lambda was used to assess the power of the discrimination among the four classes: Northern lagoons-Shrimp season, Northern lagoons-No shrimp, Southern lagoons-Shrimp season, and Southern lagoons-No shrimp. Data analyses were performed using XLASTAT for Excel.

Revenues of LECs fisheries

We analyzed the ex-vessel price, which is the price given to fishermen for catches when landed at the dock. Ex-vessel price information was available from the CONAPESCA database for years 2003 to 2009. We calculated an average ex-vessel price for species groups in Northern and Southern LECs (Appendix 2). To obtain the economic revenues generated by these species groups, we multiplied the calculated average ex-vessel price by the total landings.

Results

FAMILIES CAUGHT IN LECs

The daily records of CONAPESCA's small-scale fisheries landings (*n*= 258, 166) represented 171 species groups, classified into three categories (Fig. 2B). The Lagoon-Estuary (LE) category had 31 species groups and 13 families. The Transition Zone (TZ) category had 68 species groups and 30 families. Finally, the Coastal Area (CO) category harbored 74 species groups and 40 families (Appendix 1). After assigning a family to each record in the CONAPESCA's small-scale fisheries landings database, we obtained the percent of each family's landings from 2001 to 2009 out of the total landings for each species group's category. Results are shown for families that concentrated 85% or more of the total catch in each category (Fig. 3A). Within the LE category,the families Penaeidae and Portunidae comprised more than 89% of the total landings. For TZ the families, landings from the families Mugilidae, Penaeidae, Veneridae, Ariidae, Sciaenide, Gerreidae, Triakidae, and Lutjanidae accounted for 86% of the total catch. Finally, in the CO category the families Scombridae, Lutjanidae, Osteridae, Serranidae, diverse shark families, Muricidae, and Balistidae accounted for 86% of the total catch. Fig. 2C also shows the species groups that concentrated over 50% of the catch for each family in the different categories.

A qualitative description of the families and species groups in the different categories is shown in Figs. 2B and 2C. Overall, the amount of species groups was higher for the coastal area and lowest for the lagoon-estuarine area, but the landings values had an opposite pattern. The highest average landings were for species groups inside the lagoon. LE category had 19,606 t yr^{-1}, followed by TZ and CO categories with 7,264 t yr^{-1} and 3,179 t yr^{-1} , respectively (Fig. 3B). Landings differed significantly between categories ($F_{2,24}$ = 24.77, p = 0.00). Post-hoc comparison revealed significant differences in landings production between LE and TZ categories (Bonferroni-corrected t = 5.130; p < 0.0001) and LE and CO categories (Bonferroni corrected t = 6.738, p = 0.00). ZI and CO categories did not differ significantly (Bonferroni corrected t = 1.608; p = 0.3625) (Fig. 3B).

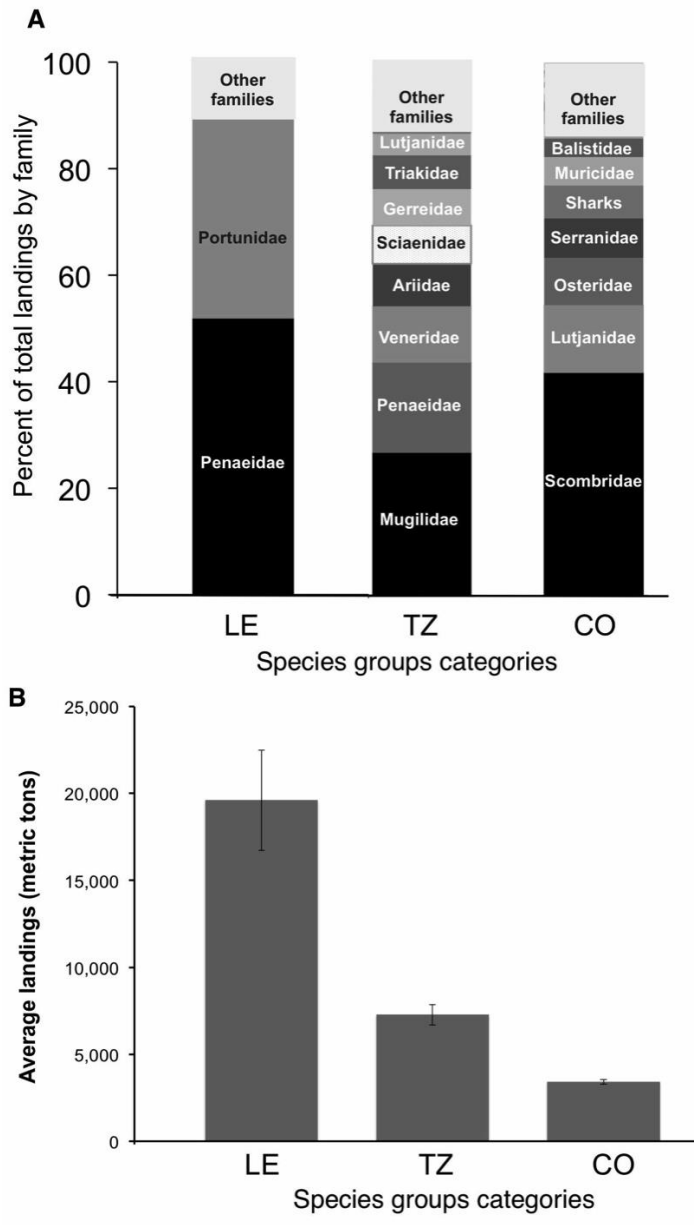

Fig. 3. (A) Percent of total landings for families and species groups caught in LECs for which landings were 85% or more of the total catch in each category. (B) Average landings for each category of species groups.

RELATIONSHIPS BETWEEN THE LANDINGS OF LECs AND THE NUMBER OF SPECIES GROUPS, TO THE AREA AND LATITUDE OF LECs.

As expected, larger lagoons harbored higher landings (Fig. 4A), but this pattern was only significantly correlated for species groups that live inside the LECs (Fig. 4B). On average, each km^2 of LEC was associated with an increase in LE average landings by 5.226 tons (y = 5.226 x + -2,438; p < 0.032, r^2 = 0.63). There was no significant relationship between the area of the LEC and the landings of TZ and CO categories, and the area of the LEC and the number of species groups in each category were not significantly related, either. Similarly, the relationship between latitude and average landings was not significantly different for any of the species group categories. However, the relationship between latitude and the number of species groups was significant only for LE category. On average, each latitudinal degree towards the north was associated with a decrease of 3 LE species groups (y = -2.8 x + 85.54; p < 0.023, r^2 =0.68; Fig. 4C).

ANALYSIS OF SIMILARITIES OF SPECIES GROUPS AMONG LECs.

The non-parametric analysis of similarities showed low dissimilarity between the species groups caught in all categories of LECs: LE (R = 0.06), TZ (R = 0.02), and CO (R = 0.03). However, pairwise post-hoc Bonferroni tests revealed significant differences between species groups caught in LECs (Table 2). These differences clustered LECs according to latitude for all categories in a very robust way (Fig. 5A-5C). For LE category the species groups caught formed two clusters, one composed of the northern LECs (Guaymas-Bahía Lobos and Huatabampo-Agiabampo) and the other composed of the southern LECs (Pabellones, Mazatlán-Laguna Huizache Caimanero and Marismas Nacionales). Species groups caught in Bahía de Santa María La Reforma (located in the central latitudes of our study area) were more similar to species groups of northern latitudes. In contrast, species groups caught in the northern LEC of Topolobampo were more similar to the ones caught in southern LECs (Fig. 5A).

For TZ category the species groups caught in LECs also formed two clusters, one of northern LECs (Guaymas-Bahía Lobos, Huatabampo-Agiabampo, Topolobampo), and the second joining the central (Bahía de Santa María La Reforma and Pabellones) and southern LECs (Mazatlán-Laguna Huizache Caimanero and Marismas Nacionales) (Fig. 4B). For the CO category, a clustering pattern similar to that for the LE category occurred. However, in the CO category the species groups caught at LEC Bahía de Santa María La Reforma were more similar to species groups caught in southern LECs (Fig. 5C). The Principal Component Analysis largely confirmed the results of the analysis of similarities. For all three categories (LE, TZ, and CO), a single dominant axis ordered the regional LECs from north to south, following a latitudinal gradient (Fig. 4D-4F). This first multivariate axis was significantly correlated with latitude (r = -0.83, p = 0.02 for LE; r = -0.83, p=0.02 for TZ; and r = -0.92, p = 0.003 for CO).

AVERAGE ANNUAL LANDINGS OF FAMILIES CAUGHT IN NORTHERN AND SOUTHERN LECs.

Because of the latitudinal association among LECs, we present the average annual landings for those families that concentrated 85% or more of the catch in northern and southern LECs. For the LE category the Penaeidae family landings in northern and southern LECs were not significantly different. The Portunidae family landings were significantly higher in northern LECs ($F_{1,1}$ = 32.63, p < 0.0001; 7,119 t yr^{-1}). Portunidae family landings were 97% less in southern LECs (183 t yr^{-1}) (Fig. 6A). For the TZ category, only the Mugilidae family landings did not show a significant difference between northern and southern LECs. All the other families analyzed had significant differences between their landings in northern and southern LECs. For the Penaeidae family, landings were 79% less in southern LECs ($F_{1,16}$ = 22.35, p < 0.00)1; 207 t yr^{-1}) than in northern LECs (1014 t yr^{-1}) (Fig. 5B). The opposite pattern was seen for families Ariidae ($F_{1,16}$ = 22.35, p < 0.0001; 46 t yr^{-1}), Veneridae ($F_{1,16}$ = 8.66, p < 0.0001; 120 t yr^{-1}), Gerreidae ($F_{1,16}$ = 37.21, p < 0.0001; 124 t yr^{-1}), Sciaenidae ($F_{1,16}$ = 5.12, p = 0.03; 318 t yr^{-1}), Lutjanidae

($F_{1,16}$ = 17.91, p < 0.0001; 87 t yr^{-1}), and Triakidae ($F_{1,16}$ = 13.03, p = 0.002; 154 t yr^{-1}), for which landings in northern LECs were significantly less. The landings values for all of these families increased in southern LECs by 100% or more (Fig. 6B).

For the CO category, landings in northern LECs were significantly higher for families Scombridae ($F_{1,16}$ = 7.68, p = 0.013; 826 t yr^{-1}), Lutjanidae ($F_{1,16}$ =33.53, p < 0.000; 299 t yr^{-1}), Serranidae ($F_{1,16}$ =21.23, p < 0.0001; 188 t yr^{-1}), and Balistidae ($F_{1,16}$ = 6.87, p < 0.018; 107 t yr^{-1}). The landings of the aforementioned families decreased by over 40% in southern LECs. The landings of diverse shark families were not significantly different among LEC latitudes (Fig. 6C). The Muricidae family only had landings in northern LECs, and Chaenidae and Osteridae family landings were mainly from southern LECs.

Table 2. Pairwise post-hoc Bonferroni test for the non-parametric analysis of similarities between LECs for the different species groups categories in LECs (see table 1 for LECs labels). Bold numbers denote significant differences between LECs with Bonferroni.

a	GBL	HA	TOP	BSM	PAB	MLH	MN
GBL		1.000	0.069	1.000	**0.002**	0.039	**0.001**
HA	0.120		0.066	1.000	**0.001**	0.036	**0.000**
TOP	0.300	0.004		0.121	0.614	1.000	0.193
BSM	0.020	0.578	**0.000**		0.006	0.069	**0.000**
PAB	0.480	0.489	0.054	0.153		0.436	1.000
MLH	0.860	0.053	0.467	0.008	0.295		0.292
MN	0.480	0.013	0.861	**0.001**	0.115	0.725	

b	GBL	HA	TOP	BSM	PAB	MLH	MN
GBL		0.161	0.047	**0.000**	1.000	0.878	0.242
HA			**0.000**	0.047	0.172	0.000	0.006
TOP				**0.000**	0.046	0.161	0.518
BSM					**0.000**	**1.000**	**0.000**
PAB						0.505	0.244
MLH							0.744
MN							

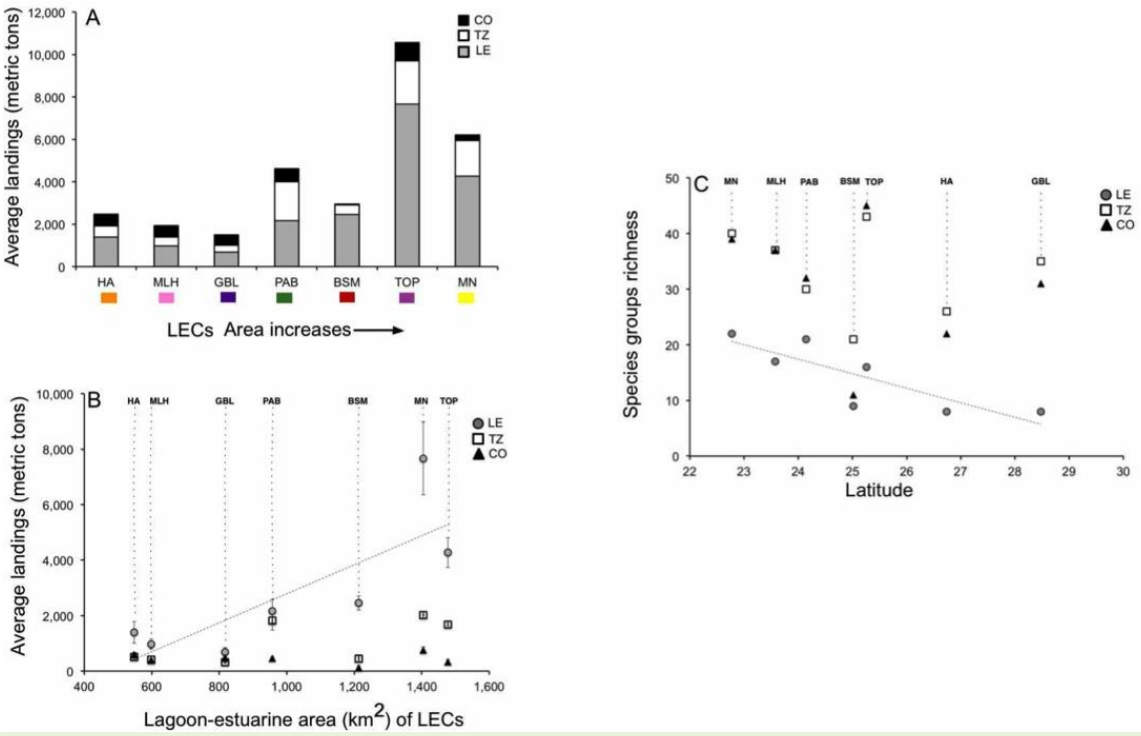

Fig. 4. (A) Shows the sum of average landings in Lagoon-estuarine complexes for LE (grey), TZ (white), and CO (black). (B) Relationship between the lagoon-estuarine area (km^2) and average landings (metric tons). (C) Relationship between the latitude of LEC and species groups richness. (B) The dotted black line shows the linear regression for LE (y = 5.226 x + -2,438; p < 0.032, r^2 = 0.63); (C) The strait black line shows the linear regression for LE (y = 2.8 x + 85.54; p < 0.023, r^2 = 0.68). Species group's categories are represented by grey circles (LE), white squares (TZ), and black triangles (CO). LECs are labeled see Table 1.

LECs FISHERIES DURING SHRIMP-FISHING SEASON AND SHRIMP-FISHING BAN

The 19 species groups for which landings were analyzed during the shrimp-fishing season (September-March) and the shrimp-fishing ban (April-August) showed landings of blue crab and grouper (cabrilla, *Mycteroperca* sp., *Epinephelus* sp.), pufferfish (*Sphoeroides* sp.), red snapper (*Lutjanus* sp.), and rays (*e.g. Rhinoptera* sp., *Myliobatis* sp.) were significantly higher during the shrimp-fishing ban (p<0.05 for ANOVA comparisons). On the other hand, hound shark (*Mustelus* sp.), mojarra (*e.g. Eucinostomus* sp., *Gerres* sp., *Diapterus* sp., *Eugerres* sp.), catfish (chihuil, *Bagre* sp.), corvina (*Cynoscion* spp.), snapper (*Lutjanus spp., Holopargus sp.*), snook (*Centroppmus* spp.), sierra (*Scomberomorus* sp.), and gulf coney (*Epinephelus* sp.) had significantly higher landings (p <0.05 for ANOVA comparisons) during the shrimp-fishing season. The landings of mullet (*Mugil* spp.), flatfish (*Paralichthys* sp, *Bothus* sp.), pampano (e.g. *Selene* sp., *Trachinotus* sp.), shark (*Carcharhinus* spp. *Sphyrna* sp., among others not identified), manta *(Myliobatus sp., Mobula spp., Rhinoptera sp., Dasyatis spp.)* and cusk eel (*Brotula* sp.) were not significantly different between fishing seasons (p > 0.05 for ANOVA comparisons; Table 3).

Table 3. ANOVA results for landings of 19 species groups caught in LECs during shrimp-fishing season and shrimp-fishing ban. Stars indicate p values for ANOVA comparisons *** ($p < 0.001$), ** ($p < 0.01$), * ($p < 0.05$). Ns refer to non-significant ANOVA comparisons. One-way ANOVA used landings as main effect for both fishing seasons; ANOVA effects shows results for a two-way ANOVA between groups, which examined the interaction of fishing season and LECs.

			Landings				ANOVA effects			
Species group category	Species group	Genus	Shrimp-fishing season		Shrimp-fishing ban		Fishing season		Fishing season * LEC	
			Mean	SE	Mean	SE	*F*	*p*	*F*	*p*
LE	Blue crab	Calllinectes	3,127	71.35	3,598	78.02	20.68	***	1.4	Ns
ZI	Grouper	*Mycteroperca, Epinephelus*	407	44.25	564	46.97	5.53	*	0.7	Ns
LE	Pufferfish	*Arothron, Canthigaster, Sphoeroides*	280	9.07	318	10.44	8.13	**	7.79	***
ZI	Rays	*Myliobatus, Mobula, Rhinoptera, Dasyatis*	741	44.99	942	37.48	12.28	***	10.15	***
CO	Red snapper	*Lutjanus*	675	18.01	863	28.35	42.49	***	5.5	***
ZI	Hound shark	*Mustelus*	1,007	32.9	750	33.28	29.61	***	2.34	*
ZI	Mojarra	*Eucinostomus, Diapterus, Gerres, Eugerres, Calamus*	423	11.13	339	9.72	32.98	***	5.67	***
ZI	Chihuil	*Bagre, Notarius*	301	7.31	277	6.68	5.67	*	6.1	***
ZI	Corvina	*Cynoscion*	242	5.19	213	6.98	12.46	***	14.99	***
ZI	Snapper	*Lutjanus, Holopargus*	163	3.12	149	4.32	7.48	**	5.71	***
ZI	Snook	*Centropomus*	146	2.4	124	5.32	16.6	***	2.91	*
CO	Sierra	*Scombero morus*	1,235	31.65	832	33.08	74.32	***	11.77	***
CO	Gulf coney	*Epinephelus*	467	19.61	266	17.29	53.16	***	2.61	*
ZI	Mullet	*Mugil*	1,290	30.5	1,215	29.33	3.44	ns	6.4	***
ZI	Flatfish	*Paralichthys, Bothus*	325	17.59	374	34.73	1.58	ns	1.52	Ns
ZI	Pampano	*Caranx, Trachinotus*	301	24.44	232	21.66	3.14	ns	1.67	Ns
CO	Shark	*Carcharhinus* spp. *Sphyrna* sp. Among others not identified	707	52.16	825	63.11	2.33	ns	4.89	***
CO	Manta	*Myliobatus, Mobula, Rhinoptera, Dasyatis*	664	58.75	825	109	1.92	ns	0.5	Ns
CO	Cusk eel	*Brotula*	368	35.38	290	42.1	2.13	ns	1.51	Ns

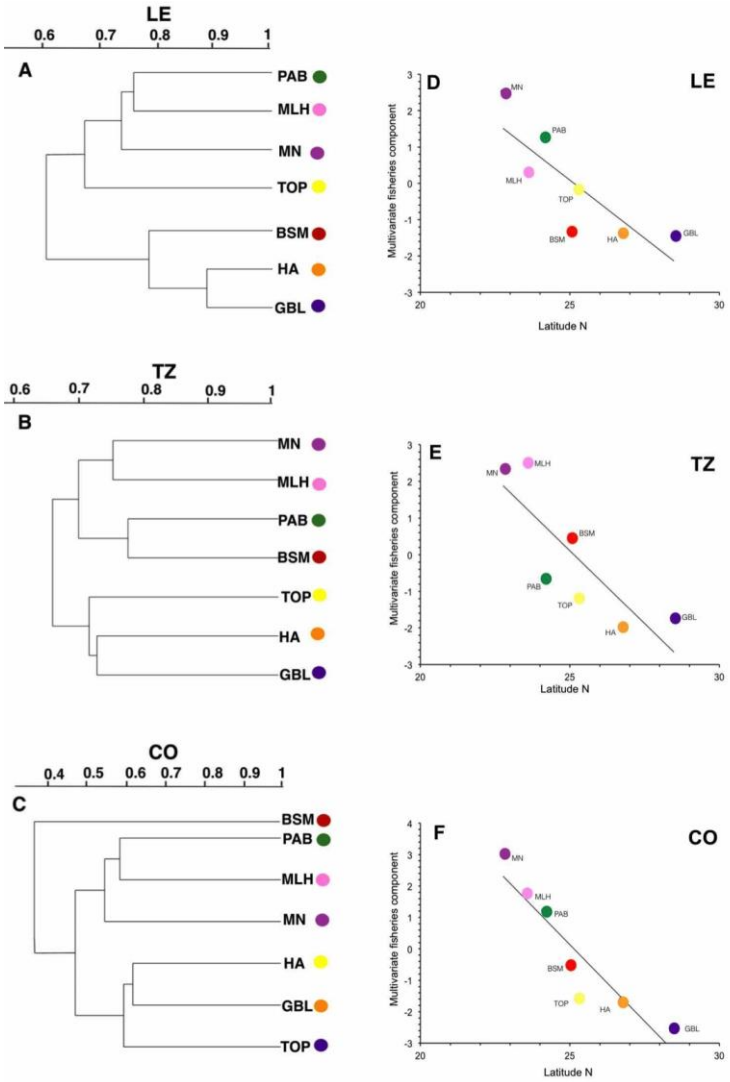

Fig. 5. Dendograms for the presence-absence of species groups in LECs for each category (A) LE, (B) TZ, and (C) CO. The Bray Curtis similarity index was used for this analysis. Abbreviations for each LEC are shown on the right (see Table 1 and Fig. 1 for color labels of LECs). Principal Component Analysis for all three categories D (LE), E (TZ), and F (CO). This first multivariate axis was significantly correlated with latitude for all categories (*r*= -0.83, *p*=0.02 for LE; *r*= -0.83, *p*=0.02 for TZ; and *r*= -0.92, *p*=0.003 for CO).

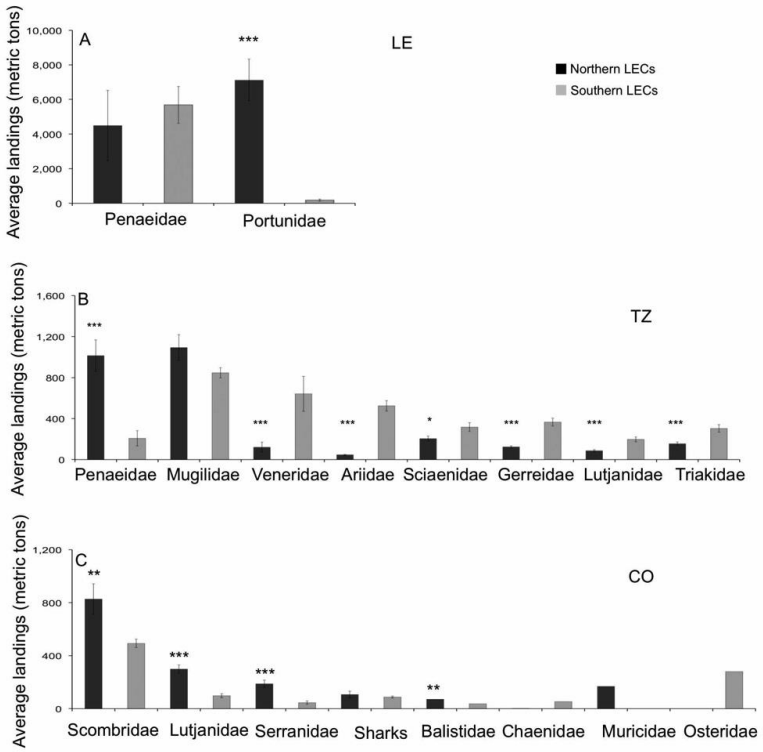

Fig. 6. Average landings of relevant families caught in northern (GBL, HA, TOP, BSM) and southern (PAB, MLH, MN) LECs. (A) LE category, (B) TZ category and (C) CO category. Stars indicate *p* values for ANOVA comparisons between landings of northern and southern LECs, * (*p* value < 0.001), ** (*p* value < 0.01), * (*p* value < 0.05).**

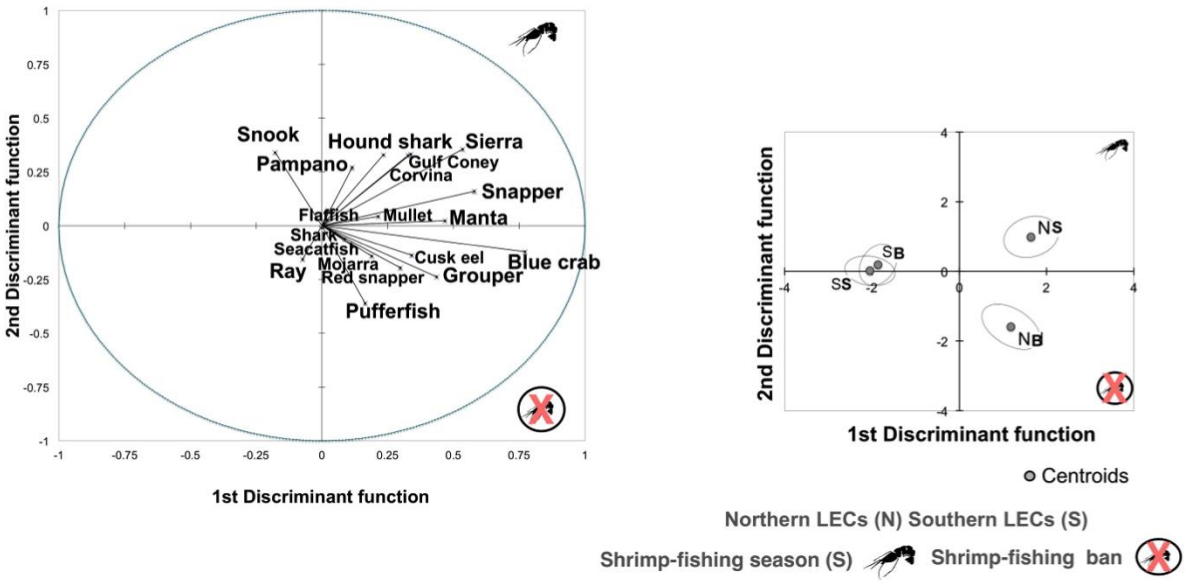

Fig. 7. (A) Discriminant function analysis performed on 19 species groups in northern and southern LECs during shrimp-fishing season and shrimp-fishing ban. The discriminant function analysis generated two significant discriminant functions, which accounted for 98.6% of total variance. (B) Group centroids (within group mean for each discriminant function) for the first and second discriminant functions.

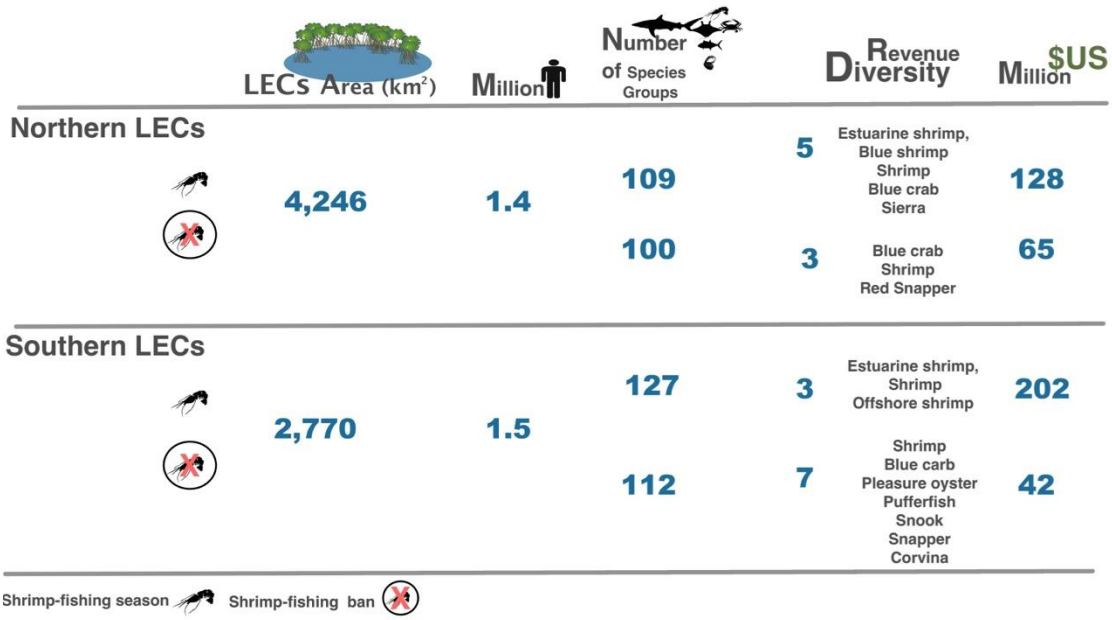

Fig. 8. Revenues for species groups caught in Northern and Southern LECs during the shrimp-fishing season and the shrimp-fishing ban. * Revenue diversity was calculated using the Simpson Index and it refers to the economic diversity that the revenues of species groups in LECs are providing. See Appendix 2 for details.

The discriminant function analysis (Fig. 7A) revealed separation of species groups primarily among fishing seasons and latitude of LECs (Fig. 7B). The discriminant function analysis generated two significant discriminant functions (Wilk's Lambda 0.119, p<0.0001), which accounted for 98.6% of total variance. The first discriminant function was related to latitude (it separated northern LECs from southern LECs). The second discriminant function had an effect only in northern LECs, where there are changes in the species groups caught during the different seasons. The plot of the group centroids on the first two discriminant functions reveals the 19 species groups associated into three distinct clusters: (1) species groups (corvina, flatfish, gulf coney, hound shark (cazon), manta, mullet, pampano, sierra, and snapper) that are being fished in northern latitudes during shrimp-fishing season, are in the upper right quadrant; (2) species groups (blue crab, cusk eel, grouper (cabrilla), mojarra, pufferfish, red snapper, sea catfish (chihuil) and shark) that are being fished in northern latitudes during the shrimp-fishing ban are in the lower right quadrant; and (3) in southern latitudes the 19 species groups did not form any clusters during the shrimp-fishing season, except for snook which is being fished in southern latitudes during shrimp-fishing season and mantarraya which is being fished in southern latitudes during the shrimp-fishing ban (Fig. 7A and 7B).

REVENUES OF LECs FISHERIES THROUGHOUT THE SHRIMP-FISHING SEASON AND LATITUDE OF LECs.
Based on the discriminant function analysis results, we documented the revenues from fisheries from northern and southern LECs throughout the different fishing seasons and related these revenues to the areas of LECs, the number of people inhabiting around each LEC, the number of species groups, and the value of revenue diversity (this last variable was calculated using Simpson's Index to estimate the economic diversity that the revenues of species groups in LECs are providing; see Fig. 8).

The numbers of species groups in Northern LECs do not change much between fishing seasons. However, the discriminant function analysis reported shifts in what is being fished between seasons (Fig. 7). The revenue diversity in Northern LECs during the shrimp-fishing season is low and produced by five species groups (estuarine shrimp, blue shrimp, shrimp, blue crab, and sierra), of which shrimps are responsible for 73% of the total US$ 128 million revenues. On the other hand, during the shrimp-fishing ban the revenue diversity is also low, provided mainly by shrimp, blue crab and red snapper. Even though there is a ban on shrimp, the data collected report 45% of the total US$ 65 million revenues were obtained from shrimp.

Although in Southern LECs there is a higher number of species groups during the shrimp-fishing season (n = 127), the discriminant function analysis showed there were no shifts in what is being fished between seasons (Fig. 7). In Southern LECs what changes between seasons is the proportion of species groups caught. Revenue diversity was also low for Southern LECs. During the shrimp-fishing season estuarine shrimp is responsible for 70% percent of the total US$ 202 million generated. On the other hand, during the shrimp-fishing ban the revenue diversity is mainly from six species groups (shrimp, blue crab, pleasure oyster, pufferfish, snook, snapper and corvina). Despite the ban on shrimp, the data collected report 32% of the total US$ 42 million revenues were obtained from shrimp. The low revenue diversity matters for management purposes and for the future conservation and sustainability of fishery ecosystem services in LECs of northwestern Mexico.

DISCUSSION

Our results underscore the importance of the area of LECs for fishery production, at least for fish and invertebrates that use LECs during their entire life cycle or are temporary residents at one stage of their life cycle, and are mainly fished inside the LEC (Fig. 4B). These results support two previously-posed ideas: (1) that coastal lagoons and estuaries can harbor species groups of economic importance for small and large-scale fisheries in high quantities [25, 40]; and (2) that mangroves and seagrass beds (both present in the studied LECs) are critical for fisheries enhancement [21, 22, 35, 36].

Because area and landings were correlated, we expected that LECs with larger areas could harbor a higher number of species groups. Pérez-Rufaza (1989) and Pérez-Rufaza *et al.* (2006) report that the positive relationship between species richness and lagoon volume, a synthetic expression of surface and depth, confirms the expectation that larger lagoons could provide a greater diversity of environments and types of bottoms with specific assemblages [16, 33]. Our results did not confirm this relationship, possibly because, besides area, the interaction of physical (hydrology, salinity, bathymetry) and biological (chlorophyll concentration) factors can also be at play in defining the amount of species groups in LECs [41, 39]. Additionally, although lagoon-estuarine areas are highly productive, there are cases where a few species can dominate the biotic community [42].

Another factor that can influence these unexpected results is fishing. Although the information presented here does not suggest overfishing, the influence of fishing pressure on the ecosystem cannot be entirely discarded, since fishing patterns can influence the presence and abundance of species in ecosystems [43]. The history of coastal resource use in the LECs studied here is millenary, and there is good evidence that the abundance and diversity of estuarine and coastal fauna in this region were higher in the past than they are today [31, 44-46]. Supporting this argument, Sala *et al.* (2004) have documented overfishing in shallow coastal areas all along the region [4].

Each latitudinal degree towards the north was associated with a decrease in species group diversity within the LE category (Fig. 4C). This agrees with the general latitudinal gradient seen in taxa of aquatic and terrestrial environments, where biodiversity decreases towards higher latitudes [34]. However for the TZ and CO categories the latitudinal pattern is absent. The wider habitat ranges and higher mobility of species groups in TZ and CO can influence this trend.

In contrast, the analysis of similarities among LECs showed that there is a variation in the fishery catches according to latitude. Within each category there was a biotic gradient that grouped species with affinities to tropical waters in southern LECs and species with affinity to temperate waters in northern LECs (Fig. 5A-C). Previous work by Erisman *et al.* (2011) demonstrated a connection between the spatial distribution of species groups of commercial fisheries landings and the latitude of primary coastal habitats throughout the Gulf of California, including mangroves, wetlands, rocky reefs, and soft seabed habitats [18-20]. Based on these geographic trends, the authors defined five fishery regions using CONAPESCA landing data and grouping coastal ecosystems through multivariate analysis.

Although our analysis occurs in a narrower spatial scale of six latitudinal degrees compared to Erisman *et al.* (2011), our results support the latitudinal regionalization of the landings, as given by the analysis of similarities and by the strong correlation between latitude and the multivariate PCA axes (Fig. 5D-5F). These results are useful for management because they highlight the importance of understanding and managing small-scale fisheries at the LEC scale. A regional management for small-scale fishers in the Gulf of California was suggested by Erisman *et al.* (2011) based on the existence of distinct fisheries regions with distinct ecological and socio-economic traits, in contrast with current management as a single region by the Mexican government [47].

Quantitatively, we found significant differences between the landings of families caught in LECs for all categories (Fig. 6). This agrees with previous studies showing that LEC fishery yields can be uneven, with some systems being more productive than others. Qualitatively, our results demonstrate that families fished in LECs have uneven fishing pressure [48-50]. For the nine years of this study, only 9-15% of the families in each category were preferentially targeted and caught (Fig. 3A). These preferences for specific families (*e.g.* Penaeidae) in LECs are part of an ancestral tradition in northwestern Mexico [46, 49, 50]. However, in the last half of the 20th century fishing preference for certain families has been exacerbated by (*i*) the coastal population boom, as people switched from agriculture to fishing, (*ii*) the high economic value of shrimp, (*iii*) government policies that promoted resource extraction, and (*iv*) the use of highly effective fishing gear [7, 27, 48, 49].

Increased fishing selectivity has had visible results. In the past, higher trophic level fish (groupers TL 4, corvinas TL 4, snapper TL 3.6, and snook TL 3.8) were commonly caught in the LECs studied [7, 46, 49, 50]. Today these are severely reduced, and lower trophic level fish families (mullet TL 2.13, sea catfish TL 3.6, mojarra TL 3.17) are the most common catch. Also, the high fishing selectivity reported here for families Portunidae (blue crab) and Penaeidae (estuarine shrimp) raises management issues of food security and future socioeconomic stability in the region.

The differences in landings of families among LECs are also linked to the physical and ecological characteristics of the LECs. Blue crab comes mainly from Topolobampo, a dry-climate LEC with a more oceanic environment, as it is a permanently open lagoon with well-defined tidal circulation, strongly influenced by winds and well-mixed vertically [9]. This is a crucial environment for completion of the blue crab life cycle [51]. Female blue crabs spawn in the mouth of the LEC; the planktonic phase individuals migrate offshore and return to the LEC as adults [52]. On the other hand, Marismas

Nacionales had the highest estuarine shrimp landings. This LEC is an alluvial plain composed of a complex of tidal channels, coastal lagoons, rivers, and seasonal flood plains, with the most extensive northern mangrove forest in North America [40]. Ecologically, this LEC has a suitable environment for the proliferation of shrimp, where mangroves provide refuge and food sources for the shrimp larval stages before they leave the estuarine and coastal lagoon waters for their pelagic life phase [8]. Such information is scarce or absent for most of the other species groups caught in LECs, and together with data on the ecology and seasonality of LECs fisheries is needed for management actions tailored to specific needs of LEC species groups.

For example, here we show that in northern LECs the catch composition of species groups can change between the shrimp-fishing season and shrimp-fishing ban. However, this situation is not present in southern LECs. Locally it is known that fishermen of LECs would switch from fishing bluecrab to shrimp when the shrimp-fishing season is over [26]. Here we demonstrate this tendency with landings statistics across northern LECs and show how blue crab is mainly available in northern LECs (Fig. 7A).

Our finding that grouper (cabrilla) is fished more in northern LECs during the shrimp-fishing ban is important for management, because there is so little knowledge of the actual state of Serranid populations in the Gulf of California (Fig. 7A, Table 3). Here their spawning aggregations have been heavily fished in recent decades [31]. Grouper (cabrilla) coastal landings in Nayarit peak in the month of April, during the spawning aggregations of their reproductive season [15, 31]. April also coincides with the shrimp-fishing ban in northwestern Mexico, a policy that reinforces the springtime fishing pressure on groupers in the northern LECs.

Arreguín-Sánchez and Arcos-Huitrón (2011), found the grouper (cabrilla) fishery from 1956 to 2009 for the coastal area of Sonora and Sinaloa to be overfished, and the coastal Central Pacific grouper fishery (including the states of Nayarit, Guadalajara, Colima, Morelia and Guerrero, see Appendix 3) to be collapsed. Although these data are at the state scale, the authors warn of the threats groupers (cabrilla) face [53]. Red snapper provides a similar example of higher landings during the shrimp-fishing ban (Table 3). Available fisheries data show red snapper is caught year round and is one of the most important resources for small-scale fisheries in Mexico's Pacific coast, both by catch volume and by market value. However, the status of the fishery is unclear [6, 15]. Arreguín-Sánchez and Arcos-Huitrón (2011) consider this fishery to be fully exploited for the coastal area of Sonora and Sinaloa and overfished for the coastal Central Pacific.

The latter examples place fisheries managers in a difficult situation, because lack of information about LEC fisheries species groups makes it hard to establish appropriate regulations. Mexico recently issued regulations for blue crab, hound shark, mullets, rays and sharks that involve a fishing ban [28]. Even the most basic descriptive studies of to LECs fisheries are therefore valuable for management purposes.

Although we present a high diversity of species groups found in LEC fisheries, only a handful of these are highly profitable (Table 4). Because price values used for this analysis were obtained using the ex-vessel price, revenues can increase when the resources enter the local, national, and international markets. Using partial information for eight fish families and blue crab that depend on mangroves, Aburto *et al.* (2008) reported that ~US$ 19 million are yearly obtained from these resources all along the Gulf of California. This amount can considerably increase if the fishery revenues from other families (*e.g.* Penaeidae) caught in LECs are taken into account (see Fig. 8). A clearer perspective of revenues could be given if precise fisher numbers were available. This is important because illegal fishing is a common activity in the region. However, fishers' statistics are scarce. In the year 2012, the states of Sonora,

Sinaloa and Nayarit had 12,740; 36,912; and 12,784 fishers respectively, but these data do not distinguish between small-scale or large-scale fishers [54]. In general, our revenue results demonstrate that a considerable amount of the revenues were obtained from shrimp during the shrimp-fishing ban, which should prompt better enforcement strategies in the region.

Lastly we acknowledge that the results presented here have data limitations, since official fisheries landings from CONAPESCA use coarse taxonomic categories that include multiple trophic levels, and landings data give no detail on fishing method or location of capture. Data collection has limited the current management of LECs fisheries, mainly because there isn't an accurate knowledge regarding the the levels of fishing exploitation. Fisheries data collection is an important topic that requires actions from the Mexican government in order to significantly improve the resolution, accuracy, and consistency of landings data [17, 18, 57]. Without these improvements in fisheries data collection, studies will continue to underestimate the ecosystem health, preventing managers and fisheries biologists from detecting overfishing, decreases in the trophic levels of catches, or other signs of environmental degradation [18,57].

Implications for conservation

Thousands of fishers receive a direct economic benefit from LECs of northwestern Mexico. Over 2 million people living around the LECs also receive indirect economic benefits from fishing activities (Fig. 7). Nevertheless LECs fisheries and their habitats continue to be undervalued by government and society [27, 55]. Historically, the government has encouraged the increasing fishing effort, unsustainable fishing practices, and societal issues occurring in LECs [7, 27, 48, 55]. For example, at Marismas Nacionales pork meal is used to attract shrimp when fishing. This activity is considered an everyday practice for shrimp fishing. Similarly, the use of cyanide and of nets with illegal mesh size is widespread [56]. Currently, similar information for other LECs studied here is unavailable.

Our study narrows the gap of information on Mexico's small-scale fisheries. Despite the data caveats mentioned previously regarding CONAPESCA fisheries data, we provide broad taxonomic information about the species groups, families and genera commonly caught in small-scale fisheries of LECs in northwestern Mexico. Our main conclusions for conservation of coastal ecosystem services of LECS are that: (1) there is a significant relationship between the area of the lagoon and the landings caught inside LECs; (2) there is a latitudinal species group gradient among the species groups caught inside the lagoon, in the transition zone, and in the coastal area; (3) for northern LECs the catch composition changes during the seasonality of the shrimp fishery, while in southern LECs such changes did not occur; and (4) only a handful of species groups caught in LECS are very profitable, of which shrimp and blue crab are the most important.

In closing, there is a need for the Mexican government to reconsider the management of LECs fisheries for more sustainable use of their resources. For this purpose, even the most basic descriptive studies related to LECs fisheries are needed. In the near future this information will also have to be supplemented by the introduction of "bottom-up efforts" that include participation by communities and fishers. This is also suggested for small-scale fisheries in the northern Gulf of California, where the social organization and participation of fishers have improved fishery practices and resource conservation in some coastal towns [5, 58-60]. The latter recommendations will preserve coastal ecosystem functions provided by LECs in northwestern Mexico, which are tightly coupled to successful fisheries and the socioeconomic well-being of coastal communities.

Acknowledgements

We thank the headquarters offices of CONAPESCA in the city of Mazatlán for sharing their databases used in this study. Thanks to J. Cota from Centro para la Biodiversidad Marina y la Conservación, for his help in fish species identification. The David and Lucile Packard Foundation provided funding for this study to O. Aburto. N. Rubio-Cisneros was a recipient of a doctoral fellowship from the Consejo Nacional de Ciencia y Tecnología of Mexico (CONACYT) and from the University of California Institute for Mexico and the United States (UCMEXUS).

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Appendix 1. Families, species groups, and total landings for lagoon-estuarine species group category.

	Common name English	Common name Spanish	Genus	Complejo Bahia Guaymas-Bahia de Lobos	Complejo Bahia Huatabampo-Bahia Agiabampo	Bahia Topolobampo	Bahia Santa Maria La Reforma	Bahia Pabellones	Bahia Mazatlan-Laguna Huizache Caimanero	Marismas Nacionales	Total Family landings (Kg)
Albulidae											**23,620**
	bonefish	MACABI	*Albula, Elops*							23,620	
Arcidae											**1,040,802**
	clam	PATA DE CABRA	*Anadara*			727,135		187,910		125,702	
	mangrove cockle	ALMEJA PATA DE MULA	*Anadara*			55					
Ariidae											**3,258,426**
	sea catfish	BAGRE	*Bagre*	518	217,542	473,973	225,501	1,836,202	235		
		BANDERA	*Bagre*	150	750	4,305		25,290	78,296	395,664	
Centropomidae											**1,139,447**
	snook	CONSTANTINO	*Centropomus*			2,176	1,916	19,757	26,092	1,063,984	
		PALETA	*Centropomus*			80		983	1,650	22,809	
Gerreidae											**1,035,686**
	mojarra	MOJARRA ALETA AMARILLA	*Diapterus*						200	40,554	
		MOJARRA BLANCA	*Eucinostomus , Gerres*			2,000		180	40,975	126,648	
		MOJARRA CHINA	*Diapterus, Eugerres, Gerres*					968	40,080	192,709	
		MOJARRA PEINETA	*Diapterus*					89			
		MOJARRA PINTA	*nd*							350	
		MOJARRA PLATEADA	*Eucinostomus, Diapterus, Gerres,*	5,430		11,712	27,922	523,962	470	21,437	
Haemulidae											**1,639,396**

	grunt	BURRO	*Haemulon/ Anisotremus*		1,000			48	342,093	1,294,233	
		MOJARRON	*Anisotremus*				503		100		
		RONCADINA	*Haemulon*			100					
		RONCO	*Haemulon*					969		350	
		MOJARRA PRIETA	*Haemulon*							97	
Mugilidae											**159,870**
	mullet	LISA SECA	*Mugil*			159,870					
Ostreidae											**4,596,292**
	pleasure oyster	OSTION DE PLACER	*Crassostrea Saccostrea*							4,596,292	
Palaemonidae										**372,337**	
	prawn	MOYA	*Macrobrachium*				25		372,312		
Penaeidae											**91,579,364**
	estuarine shrimp	CAMARON DE ESTERO	*Litopenaeus*	2,581,730	113,339	10,264,439	8,671,001	9,761,562	6,040,175	26,413,953	
	green shrimp	CAMARON VERDE	*nd*						27,616	1,783	
	shrimp	CAMARON	*Litopenaeus*	1,603,987	3,373,580	11,588,636	2,148,284	3,854,831	1,502,902	3,053,503	
		CAMARON BOTALON	*Rimapenaeus, Xiphopenaeus*					510,337			
	white shrimp	CAMARON BLANCO	*Litopenaeus*		65,961		1,745				
Portunidae											**65,726,833**

	blue crab	JAIBA	*Callinectes*	1,938,665	8,139,001	43,450,633	10,551,227	1,544,018	101,825	1,464	
Sciaenidae											**4,127,031**
	croaker	BERRUGATA	*Menticirrhus*	7,412	666,673	2,006,931	140,906	514,014	475,820	294,004	
		BOCA DULCE	*Menticirrhus*			149	20,970	152			
Tetradontidae										**1,758,438**	
	puffer fish	BOTETE	*Arothron,Canthigaster, Sphoeroides*	11,440	49,647	222,666	329,196	657,412	84,981	403,094	
		BOTETE NEGRO	*Arothron*						2		
			Total Landings	**6,149,332**	**12,561,532**	**68,980,672**	**22,096,102**	**19,461,775**	**8,763,564**	**38,444,662**	

nd=not determined

Appendix 1, continued. Families, species groups, and total landings for transition zone species group category.

Family	Common name English	Common name Spanish	Genus	Complejo Bahia Guaymas-Bahia de Lobos	Complejo Bahia Huatabampo-Bahia Agiabampo	Bahia Topolobampo	Bahia Santa Maria La Reforma	Bahia Pabellones	Bahia Mazatlan-Laguna Huizache Caimanero	Marismas Nacionales	Total Family landings (Kg)
Ariidae											**5,142,805**
	sea catfish	CHIHUIL	*Bagre, Notarius*	250	18,100	342,620	56,017	225,340	792,305	3,708,173	
Bivalvia											**852,164**
	clam	ALMEJA	*nd*	32,545	20,913	767,966		30,740			
Carangidae											**1,402,961**
	jack	CHABELITA	*Selene*						149,302	44,878	
		JUREL	*Caranx*	454,679	33,360	60,138		2,809	23,187	5,551	

		JUREL DE CASTILLA	*Caranx, Chloroscombrus, Hemicaranx, Seriola*	230							
		MONDA	*Oligoplites, Chloroscombrus, Hemicaranx,*			393				3,624	
		PALOME TA	*Oligoplites, Hemicaranx, Gnathanodon*	3,721	23,200	46,180		1,915	4,409	170,695	
		PAMPANITO	*Trachinotus, Peprilus, Alectis*			260					
		PAMPANO	*Caranx, Trachinotus*	10,757	5,049	62,466	18,295	218,095	1,780	57,988	
Centropomidae											**1,943,811**
	snook	ROBALO	*Centropomus*	1,200	1,505	64,349	24,658	323,673	77,804	1,450,622	
Dasyatidae											**2,022,508**
	ray	MANTA RRAYA	*Dasyatis, Myliobatis Gymnura Aetobatus*	3,970	38,270	133,807	497,906	488,331	210,473	649,751	
Epinephelidae											**192,606**
	grouper	CABRILLA	*MycteropercaEpinephelus*	167,867	9,598	11,213	424	2,411	643	380	
		PINTA	*Mycteroperca Epinephelus Paralabrax*	70							
Gerreidae											**4,417,975**
	mojarra	MOJARRA	*Eucinostomus Diapterus Gerres*	20,125	125,492	973,451	500	630,731	303,406	2,361,509	
		MOJARRA MALACAPA	*Eugerres*							16	
		MOJARRA MUELUDA	*Calamus*	386				69			

		MOJARRA PIEDRERA	*nd*							2,290	
Haemulidae											**864,802**
	grunt	BACOCO	*AnisotremusHaemulon*	228		6,608	92	50,651	98,906	86,008	
		CHULA	*Xenichthys*						120		
		CORCOVADO	*Orthopristis Haemulopsis*							50	
		RONCACHO	*HaemulopsisMicrolepido tus*	2,118	48,956	332,042	50,316	186,048	1,115	644	
		RONCADOR	*Haemulon AnisotremusHaemulopsis*			900					
Hemiramphidae											**228,308**
	needle fishes	PAJARITO	*Hemiramphus Hyporhamphus*						195,271	33,037	
Holothuridae											**33,357**
	sea cucumber	PEPINO DE MAR	*Isostichopus*	9,265					24,092		
Kyphosidae											**3,729**
	chub	CHOPA	*Kyphosus Girella Hermosilla Sectator*					3,579		150	
Lutjanidae											**2,554,711**
	dog snapper	PARGO COLMILLON	*Lutjanus*			167					
	mexican barred snapper	PARGO COCONACO	*Hoplopagrus*	2,886	13,500	62,274	620	21,752	3,942	4,760	
	snapper	CUBERA	*Lutjanus*							200	

	snapper	PARGO	*Lutjanus*	187,790	45,421	426,639	91,418	800,900	417,648	431,237	
	spotted rose snapper	PARGO LUNAJERO	*Lutjanus*	200	6,760	23,745		1,642		467	
	yellow snapper	PARGO ALAZAN	*Lutjanus*	511		3,883					
		PARGO AMARI LLO	*Lutjanus*	2,955		2,409			15		
		PARGO BLANCO	*Lutjanus*			970					
Mugilidae											**17,465,036**
	mullet	LISA	*Mugil*	331,162	42,462	8,270,324	1,110,929	2,728,738	293,123	1,798,361	
		LISA MACHO	*Mugil*				7,147		86,560	434,112	
		LISETA	*Mugil*	200		10,407	66,981	49,257	82,507	2,152,766	
Myliobatidae, Dasyatidae, Gymnuridae											**21,745**
	ray	RAYA	*Myliobatus Mobula Rhinoptera Dasyatis*			529			24	21,192	
Mytilidae											**10,294**
	mussel	MEJILLON	*Mytilus Mytella*		10,294						
Nemastistiidae											**106**
	rooster fish	PEZ GALLO	*Nematistius*						93	13	
Octopodidae											**199,499**
	Octopus	PULPO	*Octopus*	199,499							

Osteridae											**139,940**
	Oyster	OSTION	*Crassostrea Saccostrea Striostrea*			500			16,868	122,572	
Paralichthyidae											**547,108**
	Flatfish	LENGUA DO	*Paralichthys Bothus*	105,287	63,454	277,596	258	82,159	15,344	3,010	
Pectinidae											**1,230**
	catarina scallop	ALMEJA CATARINA	*Argopecten*			1,230					
Penaeidae											**10,994,766**
	blue shrimp	CAMARON AZUL	*Litopenaeus*	338,488	3,852,468	2,897,552	162,011	469,644	22,724	76	
	brown shrimp	CAMA RON CAFÉ	*Farfantepenaeus*			35,446	1,356,500	6,246	185		
	shrimp caugh offshore	CAMA RON DE ALTA MAR	*Litopenaeus/Farfantepenaeus*	496		357,880	129,529	1,339,231	25,803	487	
Pinnidae											**244,463**
	scallop	CALLO DE HACHA	*Atrina, Pinna*	106,439	5,277	200				132,547	
Rhinobatidae											**45,266**
	guitar fish	PEZ GUITARRA	*Rhinobatos, Zapteryx*			7,770	1,218	36,186		92	
Sciaenidae	Corvina										**4,697,601**
		CABAICUCHO	*Atractoscion*	4,888	3,777	427					
		COCUYO	*nd*	664,706	104,002	9,826		110		26,070	
		CORVINA	*Cynoscion Bairdiella*	205							

		CORVINA ALETA AMARILLA	*Cynoscion*	226,795	60,390	685,947	68,220	1,263,691	690,674	766,375	
		CORVINA BLANCA	*Cynoscion*	4,690					470		
		CORVINA CHATA	*Larimus Elattarchus Ophioscion*	4,040					18,708		
		CORVINA GRANIZA	*Cynoscion*						1,085		
		CORVINA RAYADA	*Cynoscion*					2,834	83,957	200	
	croaker	CHANO	*MicropogoniasUmbrina, Menticirrhus*						1,994		
		RATON	*Menticirrhus*			20			2,615	885	**49,249**
Serranidae											
	grouper	GARROPA	*Mycteroperca Epinephelus Paralabrax*		4,400	664					
		MERO	*Epinephelus Mycteroperca*			33	40	1,402	196	42,514	
Synodontidae											**30,231**
	lizard fish	CHILE	*Synodus*						27,671	2,560	
Tetradontidae											**577**
	pufferfish	TAMBOR	*Sphoeroides*							577	
Triakidae											**4,133,897**
	hound shark	CAZON	*Mustelus*	7,517	53,365	1,333,292	382,603	1,675,990	66,737	614,393	
Veneridae											**6,868,186**
	chocolata clam	ALMEJA CHOCO	*Megapitaria*	47,260	935	48,485		1,132,267			

		LATA									
	clam	ALMEJA ROÑOSA	*Periglypta, Chione*			12,420					
	white clam	ALMEJA BLANCA	*Dosinia*		18,364	959,872		4,648,583			
			Total landings	**2,943,425**	**4,609,312**	**18,232,900**	**4,025,682**	**16,425,024**	**3,741,756**	**15,130,832**	

nd=not determined

Appendix 1, continued. Families, species groups, and total landings for coastal zone species group category.

Family	Common name English	Common name Spanish	Genus	Complejo Bahia Guaymas-Bahia de Lobos	Complejo Bahia Huatabampo-Bahia Agiabampo	Bahia Topolobampo	Bahia Santa Maria La Reforma	Bahia Pabellones	Bahia Mazatlan-Laguna Huizache Caimanero	Marismas Nacionales	Total Family landings (Kg)
Ariidae											**24,141**
	sea catfish	CONDOR	*Bagre*			30		1,168		22,943	
Balistidae											**972,901**
	triggerfish	BOTA	*Pseudobalistes Balistes Sufflamen*					500		3,687	
		COCHI	*Pseudobalistes Balistes Sufflamen*	213,475	361,418	63,531	35,675	222,656	51,709	17,885	
		COCHINITO	*Pseudobalistes Balistes Sufflamen*			1,659		243	70		
		PISTOLA	*nd*					393			
Carangidae											**198,213**
	jacks and pompanos	CABALLO	*Selene Caranx*	2,104						756	
		COCINERO	*Caranx, Carangoides, Hemicaranx*		500	1,050				100	
		INDIO	*nd*							290	
		OJOTON	*Caranx, Trachurus Decapterus*		163,686	25,316			80	451	

			Selar								
		PAPELILLO	*Selene*						758		
		VACA	*Seriola*			170			60		
		ZAPATERO	*Oligoplites*	712							
		MEDREGAL	*Selar, Selene, Seriola,*			2,140				40	
Carcharhinidae											**340,756**
	requiem sharks	TIBURON AZUL	*Prionace*			4,470					
		TIBURON SARDINERO	*Lamna*	23		23					
		TIBURON TORO	*Carcharhinus*			98,877		133,521	31,785	72,057	
		TIBURON TORO	*Carcharhinus*			98,877		133,521	31,785	72,057	
Chaenidae											
	milkfish	SABALO	*Chanos*		1,000			1,826	42,108	145,250	
		SABALOTE	*Chanos*							289,840	
Coriphaenidae											**389,060**
	dolphinfish	DORADO	*Coryphaena*	106,974		14,208			264,078	3,800	
Diverse shark families Alopiidae, Carcharhinidae, Sphyrnidae, other sharks											**1,750,081**
	Shark	TIBURON	*Carcharhinus* spp. *Sphyrna* sp. Among others *nd*	458,807	53,935	428,802	19,358	365,656	293,816	129,707	
Diverse families of small shrimp											**105,013**
	small shrimp	CAMARON PACOTILLA	*Litopenaeus Farfantepenaeus*			69185		30657	5171		

Engraulidae											**2,600**
	sardine	SARDINA	*Cetengraulis Opisthonema Etrumeus Sardinops*			2,600					
Ephippidae											**380**
	Spadefishes, batfishes and scats	MONA	*Chaetodipterus Parapsettus*			280	100				
Epinephelidae											**380**
	grouper	CARDENAL	*Paranthias*			280	100				
Ginglymostomatidae											**371**
	nurse shark	TIBURON GATA	*Ginglymostoma*							371	
Hiatellidae											**16,402**
	clam	ALMEJA GENEROSA	*Panopea*	16,402							
Istiophoridae											**7,025**
	billfish	MARLIN	*Makira Tetrapturus Kajikia*			6,755		230	40		
Labridae											**9,612**
	wrass	VIEJA	*Bodianus*		600	8,893				119	
Lutjanidae											**3,572,178**
	red snapper	HUACHINANGO	*Lutjanus*	30,829	1,275,823	1,273,184	8,203	588,720	41,912	215,544	
	snapper	FLAMENCO	*Lutjanus, Hoplopargus*			25				709	
		GUACHITO	*Lutjanus*			105,163			1,086	30,792	
		PARGO JOSELILLO	*Lutjanus*							188	
Malacanthidae											**730,119**
	tilefish	CONEJO	*Caulolatilus*	20,170	67,394	300,845		18,607	3,394	860	

		PIERNA	*Caulolatilus*	41,259	176,969	73,957		2,682			
		SALMON	*Caulolatilus*	20,357		3,480			145		
Melongenidae											**998**
	pacific crown conch	CARACOL BURRO	*Melongena*			932		36	30		
Merlucciidae											**36,446**
	merluccid hakes	MERLUZA	*Merluccius*	25,049	2,700	8,697					
Mugilidae											**34,980**
	mullet	LEBRANCHA	*Mugil*			3,134	29,631	1,515	700		
Mullidae											**71,915**
	goatfish	CHIVATO	*Mulloidichthys Pseudupeneus*	68,842							
		CHIVO	*Mulloidichthys Pseudupeneus*	2,990					83		
Muraenidae											**75**
	morey eels	MORENA	*Muraena Gymnothorax Echidna*							75	
Muricidae											**1,512,177**
	black murex snail	CARACOL CHINO	*Hexaplex*	1,244	131,148	22,957					
	murex	CARACOL	*Hexaplex Haustellum*	227,682	1,079,969	49,177					
Myliobatidae											**755,599**
	ray	GAVILAN	*Rhinoptera Myliobatis Aetobatus*							5,010	
		MANTA	*Myliobatus Mobula Rhinoptera Dasyatis*	71,655	143,168	412,813	4,189	20,995	8,324	89,445	
Ophidiidae											**314,993**

	cusk eel	LENGUA	*Brotula*	17,520	32,978	214,661	4,673	22,087	17,373	5,701	
Osteridae											**2,519,657**
	rock oyster	OSTION DE ROCA	*Crassostrea Saccostrea Striostrea*					1,011,540	1,452,965	55,152	
Palinuridae											**247,910**
	lobster	LANGOSTA	*Panulirus*	13,840				17,008	216,824	20	
		LANGOSTA ROJA	*Panulirus*					218			
Pectinidae											**105,013**
	clam	ALMEJA VOLADORA	*Pecten Argopecten Nodipecten*			69,185		30,657	5,171		
Polyprionidae											**200**
	wreckfish	PESCADA	*nd*	200							
Scaridae											**6,922**
	parrotfish	LORO	*Scarus Nicholsina*						2,909	3	
		PERICO	*Scarus, Nicholsina*	3,645					365		
Sciaenidae											**62**
	totoaba	MACHORRO	*Totoaba*						62		
Scombridae											**11,877,733**
	bonito	BONITO	*Sarda, Auxis, Euthynnus*					50	2,000	75	
	mackerel	BARRILETE	*Katsuwonus, Sarda, Auxis, Euthynnus*		2,200	475		813	41,067		
		BARRILETE NEGRO	*Euthynnus*			20			300		
	sierra	SIERRA	*Scomberomorus*	2,050,741	1,353,806	3,809,987	224,345	1,042,051	2,146,126	1,203,091	
	tuna	ATUN	*Thunnus, Katsuwonus Euthynnus*			586					

		GALLINA	*Epinephelus*						380	1,027	
		GALLINETA	*Epinephelus*							25	
		LUCERO	*Paralabrax*			1,150			625		
		PAYASO	*Nd*	144,274	165,459	310,325	8,679				
		VERDILLO	*Paralabrax*	200		1,000			600	550	
Serranidae											**2,100,085**
	gulf coney	BAQUETA	*Epinephelus Hyporthodus*	217,416	48,474	351,335	31,533	212,662	171,032	21,021	
	grouper	BAYA	*Mycteroperca*	6,338	949	8		316			
	groupers	EXTRANJERO	*Paralabrax Diplectrum*	372,221	9,054	22,632					
		EXTRAVIADO	*Nd*	800							
		GALLINA	*Epinephelus*						380	1,027	
		GALLINETA	*Epinephelus*							25	
		LUCERO	*Paralabrax*			1,150			625		
		PAYASO	*Nd*	144,274	165,459	310,325	8,679				
		VERDILLO	*Paralabrax*	200		1,000			600	550	
Sphyraenidae											**44,644**
	barracuda	BARRACUDO	*Sphyraena*	34,774		2,748			500		
		PICUDA	*Sphyraena*						6,622		
Sphyrnidae											**13,582**
	hammerhead shark	TIBURON MARTILLO	*Sphyrna*					12,855		727	
Squatinidae											**193,228**
	angel shark	TIBURON ANGELITO	*Squatina*	113,720	23,673	17,373		595	23,862	14,005	
Syngnathidae											**490**
	pipefish	CULEBRA	*Microphis*							490	

Triakidae											**41,830**
	hound shark										
		TIBURON TRIPA	*Mustelus*	14,748	1,065	3,652		500		21,865	
			Total landings	**4,299,011**	**5,095,968**	**7,787,770**	**366,486**	**3,740,757**	**4,834,132**	**2,353,671**	

nd=not determined

Appendix 2. Revenues Shrimp-fishing season Northern LECs

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (Mexican pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CAMARON DE ESTERO	estuarine shrimp	9,933,522	54.83	544,680,210.51	42,519,922.76	33.05
CAMARON AZUL	blue shrimp	5,226,681	65.91	344,503,611.41	26,893,334.22	20.90
CAMARON	shrimp	6,923,222	45.22	313,091,251.91	24,441,159.40	19.00
JAIBA	blue crab	20,470,801	9.86	201,943,552.59	15,764,524.01	12.25
SIERRA	sierra	3,685,481	9.45	34,832,914.17	2,719,197.05	2.11
GUACHINANGO	red snapper	1,070,040	26.85	28,733,176.32	2,243,027.04	1.74
CAMARON DE ALTA MAR	offshore shrimp	358,376	61.96	22,204,275.24	1,733,354.82	1.35
LISA	mullet	3,403,587	5.59	19,035,581.37	1,485,993.86	1.16
CAZON	hound shark	773,414	17.07	13,200,714.43	1,030,500.74	0.80
PARGO	snapper	367,057	29.36	10,778,290.26	841,396.59	0.65
BAQUETA	grouper	380,862	26.71	10,171,620.64	794,037.52	0.62
CORVINA	corvina	545,451	15.45	8,427,238.29	657,864.03	0.51
CARACOL CHINO	black murex snail	539,359	14.05	7,575,978.55	591,411.28	0.46
BERRUGATA	croaker	1,001,443	6.80	6,813,918.54	531,921.82	0.41
MANTA	ray	272,223	21.21	5,772,672.13	450,637.95	0.35
BAGRE	sea catfish	438,550	11.86	5,202,978.40	406,165.37	0.32
CAMARON BLANCO	white shrimp	65,961	78.33	5,166,945.00	403,352.46	0.31
COCHI	triggerfish	325,257	14.17	4,608,703.52	359,773.89	0.28
JUREL	jack	294,560	14.40	4,242,842.24	331,213.29	0.26
BOTETE	pufferfish	107,547	36.08	3,880,175.99	302,902.11	0.24
CAMARON PACOTILLA	small shrimp	69,185	55.29	3,825,219.25	298,611.96	0.23
LENGUADO	flatfish	164,283	22.92	3,765,663.83	293,962.83	0.23
MOJARRA	mojarra	646,474	5.82	3,760,261.84	293,541.13	0.23
TIBURON	shark	246,842	13.92	3,435,007.93	268,150.50	0.21
ALMEJA	clam	237,219	13.61	3,228,307.29	252,014.62	0.20
CAMARON CAFÉ	brown shrimp	35,446	69.31	2,456,680.46	191,778.33	0.15
LENGUA	cusk eel	143,089	16.60	2,375,414.99	185,434.43	0.14
ALMEJA BLANCA	white clam	303,350	7.03	2,131,278.39	166,376.14	0.13
PAYASO	grouper	177,280	10.89	1,930,889.90	150,733.01	0.12
ALMEJA PATA DE MULA	mangrove cockle	336,806	5.10	1,718,078.29	134,120.09	0.10

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing season Northern LECs

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (Mexican pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
OJOTON	jack	68,065	24.56	1,671,538.30	130,486.99	0.10
ROBALO	snook	51,515	31.03	1,598,316.71	124,771.02	0.10
CALLO DE HACHA	scallop	13,948	113.28	1,579,959.70	123,337.99	0.10
CABRILLA	grouper	50,677	29.85	1,512,883.20	118,101.73	0.09
GUACHITO	snapper	68,662	21.81	1,497,403.78	116,893.35	0.09
CHANO	croaker	188,359	7.36	1,385,430.01	108,152.23	0.08
MANTARRAYA	ray	80,466	16.47	1,325,225.76	103,452.44	0.08
RONCACHO	grunt	223,348	5.74	1,281,769.36	100,060.06	0.08
CONEJO	tilefish	162,755	6.56	1,068,079.69	83,378.59	0.06
PIERNA	tilefish	96,671	9.62	929,652.78	72,572.43	0.06
PARGO COCONACO	mexican barred snapper	43,530	21.32	927,939.52	72,438.68	0.06
EXTRANJERO	grouper	56,377	15.62	880,685.37	68,749.83	0.05
PULPO	octopuss	25,428	34.05	865,849.35	67,591.67	0.05
DORADO	dolphinfish	47,016	13.74	646,090.84	50,436.44	0.04
ALMEJA CHOCOLATA	chocolata clam	60,196	10.64	640,227.46	49,978.72	0.04
ALMEJA VOLADORA	clam	15,418	40.50	624,429.00	48,745.43	0.04
CARACOL	snail	31,162	18.91	589,156.56	45,991.93	0.04
CHIVATO	goatfish	19,550	28.91	565,172.73	44,119.65	0.03
ALMEJA GENEROSA	clam	16,402	30.00	492,060.00	38,412.18	0.03
CHIHUIL	sea catfish	89,129	5.35	476,412.82	37,190.70	0.03
PARGO LUNAJERO	spotted rose snapper	16,758	25.56	428,334.48	33,437.51	0.03
LANGOSTA	lobster	5,437	72.50	394,182.50	30,771.47	0.02
TIBURON TORO	requiem shark	77,163	4.86	375,171.83	29,287.42	0.02
PAMPANO	pampano	58,773	6.22	365,432.12	28,527.10	0.02
PALOMETA	jack	48,481	6.66	322,918.09	25,208.28	0.02
LISA SECA	mullet	62,950	5.13	322,618.75	25,184.91	0.02
TIBURON ANGELITO	angel shark	18,733	11.23	210,386.00	16,423.58	0.01

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing season Northern LECs

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (Mexican pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
TIBURON TRIPA	hound shark	12,281	14.00	171,934.00	13,421.86	0.01
MEJILLON	mussel	7,468	17.07	127,453.87	9,949.56	0.01
ALMEJA RoñOSA	clam	11,420	10.75	122,765.00	9,583.53	0.01
BARRACUDO	barracuda	17,743	6.04	107,197.29	8,368.25	0.01
CORVINA ALETA AMARILLA	corvina	4,620	19.83	91,630.00	7,153.01	0.01
CABAICUCHO	corvina	3,216	25.44	81,807.00	6,386.18	0.00
PEPINO DE MAR	sea cucumber	5,585	12.67	70,743.33	5,522.51	0.00
PARGO ALAZAN	yellow snapper	2,724	25.71	70,045.71	5,468.05	0.00
BACOCO	grunt	2,435	22.82	55,570.18	4,338.03	0.00
PARGO AMARILLO	yellow snapper	1,919	27.64	53,034.18	4,140.06	0.00
ALMEJA CATARINA	catarina scallop	1,230	43.00	52,890.00	4,128.81	0.00
LISETA	mullet	8,517	5.75	48,972.75	3,823.01	0.00
SALMON	tilefish	6,143	7.57	46,511.29	3,630.86	0.00
PERICO	parrotfish	1,994	19.38	38,652.92	3,017.40	0.00
MEDREGAL	jack	1,564	22.21	34,737.26	2,711.73	0.00
COCHINITO	triggerfish	1,430	21.25	30,387.50	2,372.17	0.00
LEBRANCHA	mullet	3,134	8.85	27,723.85	2,164.23	0.00
CORVINA BLANCA	corvina	2,950	9.33	27,533.33	2,149.36	0.00
VIEJA	wrass	2,251	10.21	22,992.36	1,794.88	0.00
PEZ GUITARRA	guitar fish	1,380	15.67	21,620.00	1,687.74	0.00
CONSTANTINO	snook	2,176	9.00	19,584.00	1,528.81	0.00
MERLUZA	merluccid hakes	2,294	8.25	18,925.50	1,477.40	0.00
MOJARRA BLANCA	mojarra	2,000	9.00	18,000.00	1,405.15	0.00
COCINERO	jack	1,100	15.00	16,500.00	1,288.06	0.00
BAYA	grouper	461	34.50	15,904.50	1,241.57	0.00
BANDERA	sea catfish	1,470	10.29	15,120.00	1,180.33	0.00
BARRILETE	mackerel	2,675	5.10	13,642.50	1,064.99	0.00
LUCERO	grouper	1,150	11.50	13,225.00	1,032.40	0.00
MARLIN	billfish	578	21.50	12,427.00	970.10	0.00
ALMEJA	clam	213	47.50	10,117.50	789.81	0.00

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing season Northern LECs

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (Mexican pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CARACOL BURRO	pacific crown conch	632	13.40	8,468.80	661.11	0.00
CABALLO	jack	240	27.00	6,480.00	505.85	0.00
ATUN	tuna	570	11.00	6,270.00	489.46	0.00
EXTRAVIADO	grouper	400	14.00	5,600.00	437.16	0.00
SARDINA	sardine	2,600	2.00	5,200.00	405.93	0.00
JUREL DE CASTILLA	jack	200	18.00	3,600.00	281.03	0.00
PARGO COLMILLON	dog snapper	120	30.00	3,600.00	281.03	0.00
CARDENAL	grouper	280	10.00	2,800.00	218.58	0.00
MOJARRA PLATEADA	mojarra	742	3.50	2,597.00	202.73	0.00
MONDA	jack	393	4.00	1,572.00	122.72	0.00
PAMPANITO	jack	200	5.00	1,000.00	78.06	0.00
VERDILLO	grouper	200	5.00	1,000.00	78.06	0.00
TIBURON SARDINERO	shark	46	20.00	920.00	71.82	0.00
RONCADINA	grunt	100	5.00	500.00	39.03	0.00
RONCADOR	grunt	150	3.00	450.00	35.13	0.00
PARGO BLANCO	snapper	17	20.00	340.00	26.54	0.00
RAYA	ray	10	25.00	250.00	19.52	0.00
PALETA	snook	20	7.00	140.00	10.93	0.00
VACA	jack	20	7.00	140.00	10.93	0.00
RATON	croaker	20	5.00	100.00	7.81	0.00
GARROPA	grouper	11	5.00	55.00	4.29	0.00
BARRILETE NEGRO	mackerel	20	2.00	40.00	3.12	0.00
Grand Total		60,361,449	2,161.84	1,647,979,551.01	128,647,896.25	4.87
						Diversity Revenue value

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing ban Northern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CAMARON	shrimp	9,642,981	39.28	378,731,662.32	29,565,313.22	45.46
JAIBA	blue crab	24,179,689	10.08	243,727,123.29	19,026,317.20	29.26
GUACHINANGO	red snapper	1,088,810	27.22	29,638,497.01	2,313,700.00	3.56
CAMARON AZUL	blue shrimp	367,080	66.34	24,353,914.59	1,901,164.29	2.92
CAMARON DE ESTERO	estuarine shrimp	309,163	60.45	18,688,641.35	1,458,910.33	2.24
LISA	mullet	2,734,890	5.66	15,473,981.80	1,207,961.11	1.86
CALLO DE HACHA	scallop	95,076	110.42	10,498,734.74	819,573.36	1.26
CARACOL CHINO	black murex snail	713,604	14.56	10,387,307.20	810,874.88	1.25
SIERRA	sierra	1,045,706	9.30	9,722,538.41	758,980.36	1.17
MANTA	ray	318,410	21.94	6,987,391.76	545,463.84	0.84
BERRUGATA	croaker	1,041,598	6.19	6,446,149.54	503,212.30	0.77
CAZON	hound shark	364,576	16.38	5,973,504.15	466,315.70	0.72
PARGO	snapper	206,197	27.94	5,760,428.37	449,682.15	0.69
ALMEJA BLANCA	white clam	663,464	8.54	5,665,853.73	442,299.28	0.68
PULPO	octopuss	139,448	36.22	5,050,729.09	394,280.18	0.61
ALMEJA	clam	584,205	7.68	4,487,648.20	350,323.83	0.54
BOTETE	pufferfish	110,322	37.69	4,157,553.93	324,555.34	0.50
LENGUADO	flatfish	185,196	22.13	4,098,331.78	319,932.22	0.49
CABRILLA	grouper	110,175	27.92	3,075,819.64	240,110.82	0.37
JUREL	jack	202,682	15.06	3,051,610.54	238,220.96	0.37
COCHI	triggerfish	228,323	13.32	3,041,651.75	237,443.54	0.37
PAYASO	grouper	293,681	10.02	2,943,058.53	229,746.96	0.35
TIBURON	shark	231,966	12.41	2,878,920.49	224,740.09	0.35

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar

Appendix 2, continued. Revenues Shrimp-fishing ban Northern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
BAQUETA	grouper	98,070	26.90	2,638,199.29	205,948.42	0.32
CORVINA	corvina	161,144	15.57	2,508,850.36	195,850.93	0.30
OJOTON	jack	88,242	26.01	2,294,868.75	179,146.66	0.28
CHANO	croaker	265,673	7.18	1,907,806.97	148,931.07	0.23
CARACOL	snail	111,637	14.49	1,617,573.61	126,274.29	0.19
PIERNA	tilefish	167,874	9.58	1,607,640.42	125,498.86	0.19
ALMEJA PATA DE MULA	mangrove cockle	336,179	4.70	1,578,518.98	123,225.53	0.19
LENGUA	cusk eel	86,554	16.68	1,444,058.98	112,729.04	0.17
BAGRE	sea catfish	111,504	12.41	1,383,733.67	108,019.80	0.17
MOJARRA	mojarra	262,476	5.24	1,376,091.34	107,423.21	0.17
CONEJO	tilefish	187,918	6.38	1,199,054.76	93,603.03	0.14
MANTARRAYA	ray	60,568	18.17	1,100,520.56	85,911.05	0.13
CHIHUIL	sea catfish	175,406	5.23	917,633.24	71,634.13	0.11
DORADO	billfish	54,166	16.17	875,683.67	68,359.38	0.11
GUACHITO	snapper	31,236	24.02	750,358.13	58,575.97	0.09
RONCACHO	grunt	100,719	5.81	585,154.67	45,679.52	0.07
PARGO COCONACO	mexican barred snapper	25,242	22.29	562,644.18	43,922.26	0.07
EXTRANJERO	grouper	34,694	15.71	545,042.74	42,548.22	0.07
LISA SECA	mullet	83,420	5.38	449,184.62	35,065.15	0.05
ROBALO	snook	11,182	31.85	356,129.76	27,800.92	0.04
LANGOSTA	lobster	5,421	55.67	301,769.00	23,557.30	0.04

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollars

Appendix 2, continued. Revenues Shrimp-fishing ban Northern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
BAYA	grouper	6,093	30.61	186,513.50	14,559.99	0.02
ALMEJA CHOCOLATA	chocolata clam	17,460	8.25	144,045.00	11,244.73	0.02
PALOMETA	jack	18,710	7.30	136,664.35	10,668.57	0.02
CHIVATO	goatfish	4,652	29.13	135,528.27	10,579.88	0.02
ALMEJA VOLADORA	clam	2,740	40.00	109,600.00	8,555.82	0.01
TIBURON ANGELITO	angel shark	12,137	8.86	107,577.95	8,397.97	0.01
MERLUZA	merluccid hakes	11,200	9.25	103,600.00	8,087.43	0.01
GARROPA	grouper	5,053	20.50	103,586.50	8,086.38	0.01
PARGO AMARILLO	yellow snapper	3,295	29.81	98,222.38	7,667.63	0.01
CHIVO	goatfish	2,990	30.00	89,700.00	7,002.34	0.01
BARRACUDO	barracuda	15,513	5.70	88,424.10	6,902.74	0.01
MARLIN	billfish	6,177	12.80	79,065.60	6,172.18	0.01
TIBURON TRIPA	hound shark	5,958	13.07	77,879.57	6,079.59	0.01
VIEJA	wrass	6,792	11.03	74,924.25	5,848.89	0.01
SALMON	tilefish	8,611	8.67	74,628.67	5,825.81	0.01
PEZ GUITARRA	guitar fish	5,590	13.33	74,533.33	5,818.37	0.01
TIBURON AZUL	requiem shark	4,470	13.00	58,110.00	4,536.30	0.01
BACOCO	grunt	3,840	15.00	57,600.00	4,496.49	0.01
TIBURON TORO	requiem shark	11,655	4.74	55,231.75	4,311.61	0.01

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing ban Northern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
PARGO ALAZAN	yellow snapper	1,670	26.67	44,533.33	3,476.45	0.01
CABAICUCHO	corvina	2,813	15.69	44,142.46	3,445.94	0.01
PEPINO DE MAR	sea cucumber	3,680	10.00	36,800.00	2,872.76	0.00
MEJILLON	mussel	2,826	10.50	29,673.00	2,316.39	0.00
PARGO BLANCO	snapper	953	29.71	28,317.71	2,210.59	0.00
PARGO LUNAJERO	spotted rose snapper	1,207	21.33	25,749.33	2,010.10	0.00
PERICO	parrotfish	1,197	20.33	24,339.00	1,900.00	0.00
PAMPANO	pampano	3,359	7.07	23,752.93	1,854.25	0.00
CABALLO	jack	721	30.80	22,206.80	1,733.55	0.00
RAYA	ray	519	30.00	15,570.00	1,215.46	0.00
BANDERA	sea catfish	3,585	3.50	12,547.50	979.51	0.00
BURRO	grunt	1,000	12.00	12,000.00	936.77	0.00
MOJARRA PLATEADA	mojarra	2,263	4.67	10,560.67	824.41	0.00
LISETA	mullet	2,090	4.00	8,360.00	652.62	0.00
CORVINA BLANCA	corvina	1,090	7.00	7,630.00	595.63	0.00
CARACOL BURRO	pacific crown conch	300	23.33	7,000.00	546.45	0.00
EXTRAVIADO	nd	400	16.00	6,400.00	499.61	0.00
OSTION	oyster	500	12.00	6,000.00	468.38	0.00
RONCADOR	grunt	750	7.50	5,625.00	439.11	0.00
PESCADA	wreckfish	200	25.00	5,000.00	390.32	0.00
SABALO	milkfish	1,000	4.00	4,000.00	312.26	0.00

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing ban Northern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
VERDILLO	grouper	1,000	4.00	4,000.00	312.26	0.00
MEDREGAL	jack	100	30.00	3,000.00	234.19	0.00
COCUYO	corvina	205	11.00	2,255.00	176.03	0.00
MOJARRA MUELUDA	mojarra	386	4.00	1,544.00	120.53	0.00
ALMEJA Roñosa	clam	1,000	1.50	1,500.00	117.10	0.00
VACA	jack	150	10.00	1,500.00	117.10	0.00
CORVINA ALETA AMARILLA	corvina	70	20.00	1,400.00	109.29	0.00
MERO	grouper	33	35.00	1,155.00	90.16	0.00
ALMEJA	clam	190	5.00	950.00	74.16	0.00
COCINERO	jack	450	2.00	900.00	70.26	0.00
PATA DE CABRA	clam	55	15.00	825.00	64.40	0.00
PAMPANITO	jack	60	12.00	720.00	56.21	0.00
FLAMENCO	snapper	25	25.00	625.00	48.79	0.00
JUREL DE CASTILLA	jack	30	20.00	600.00	46.84	0.00
CONDOR	sea catfish	30	7.00	210.00	16.39	0.00
ATUN	tuna	16	10.00	160.00	12.49	0.00
Grand Total		47,505,426	1,795.86	833,098,556.88	65,035,016.15	3.38
						Diversity Revenue value

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing season Southern LECs.

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CAMARON DE ESTERO	estuarine shrimp	42,658,193	39.89	1,701,814,599.07	132,850,476.12	65.92
CAMARON	shrimp	6,143,493	40.63	249,592,803.36	19,484,215.72	9.67
CAMARON DE ALTA MAR	offshore shrimp	1,490,093	75.74	112,856,480.24	8,810,029.68	4.37
JAIBA	blue crab	4,767,262	13.02	62,087,079.66	4,846,766.56	2.41
CAMARON CAFÉ	brown shrimp	1,362,746	31.33	42,693,427.06	3,332,820.22	1.65
ROBALO	snook	973,219	38.26	37,235,449.28	2,906,748.58	1.44
CAMARON AZUL	blue shrimp	654,455	55.40	36,254,538.57	2,830,174.75	1.40
PARGO	snapper	886,604	33.13	29,370,766.39	2,292,799.87	1.14
CAZON	hound shark	1,645,213	17.39	28,612,270.13	2,233,588.61	1.11
SIERRA	sierra	2,660,223	10.31	27,423,432.59	2,140,783.18	1.06
CORVINA	corvina	1,294,995	20.11	26,037,975.00	2,032,628.81	1.01
BOTETE	pufferfish	591,082	36.30	21,456,778.73	1,675,002.24	0.83
LISA	mullet	2,751,408	7.06	19,431,299.59	1,516,885.21	0.75
CHIHUIL	sea catfish	2,380,844	6.80	16,195,781.60	1,264,307.70	0.63
LANGOSTA	lobster	130,685	122.11	15,958,404.51	1,245,777.09	0.62
BAGRE	sea catfish	1,204,119	11.19	13,479,803.87	1,052,287.58	0.52
GUACHINANGO	red snapper	515,512	24.99	12,883,737.30	1,005,756.23	0.50
MOJARRA	mojarra	1,488,104	7.23	10,765,025.38	840,361.08	0.42
CONSTANTINO	snook	698,907	13.94	9,740,437.32	760,377.62	0.38
OSTION DE ROCA	rock oyster	1,032,442	9.43	9,736,632.00	760,080.56	0.38
OSTION DE PLACER	pleasure oyster	616,896	13.84	8,535,063.27	666,281.29	0.33
LISETA	mullet	1,562,695	4.72	7,381,177.45	576,204.33	0.29
MANTARRAYA	mantaray	692,802	10.22	7,080,184.00	552,707.57	0.27
CALLO DE HACHA	scallop	52,117	135.03	7,037,301.27	549,359.97	0.27
CAMARON BOTALON	shrimp nd	509,387	13.75	7,001,674.13	546,578.78	0.27
ALMEJA BLANCA	white clam	2,613,118	2.40	6,266,239.48	489,167.80	0.24
BAQUETA	grouper	272,581	22.18	6,046,485.88	472,012.95	0.23

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dolla

Appendix 2, continued. Revenues Shrimp-fishing season Southern LECs.

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
BERRUGATA	croaker	613,532	7.94	4,869,696.03	380,148.01	0.19
TIBURON ALETA	shark fin	31,940	125.03	3,993,425.80	311,742.84	0.15
BURRO	grunt	764,971	4.32	3,300,990.91	257,688.60	0.13
TIBURON	shark	274,477	11.52	3,163,334.74	246,942.60	0.12
ALMEJA CHOCOLATA	chocolata clam	552,626	5.00	2,765,075.87	215,852.92	0.11
MOYA	prawn	251,619	9.80	2,465,267.11	192,448.64	0.10
MOJARRA PLATEADA	mojarra	283,328	7.02	1,989,508.00	155,308.98	0.08
COCHI	triggerfish	200,474	9.82	1,968,385.75	153,660.09	0.08
LISA MACHO	mullet	176,463	10.88	1,919,958.93	149,879.70	0.07
BACOCO	grunt	103,181	17.79	1,836,014.85	143,326.69	0.07
BANDERA	sea catfish	327,923	5.09	1,667,523.34	130,173.56	0.06
CAMARON PACOTILLA	small shrimp	31,657	50.81	1,608,571.31	125,571.53	0.06
DORADO	dolphinfish	173,280	9.10	1,576,848.00	123,095.08	0.06
PAMPANO	pampano	162,464	8.47	1,375,546.98	107,380.72	0.05
ALMEJA PATA DE MULA	mangrove cockle	138,482	6.94	961,608.65	75,067.03	0.04
RONCACHO	grunt	124,473	7.44	926,219.12	72,304.38	0.04
MOJARRA CHINA	mojarra	110,624	7.89	872,662.18	68,123.51	0.03
MOJARRA BLANCA	mojarra	72,602	11.81	857,211.88	66,917.40	0.03
TIBURON TORO	requiem shark	176,727	4.28	756,974.42	59,092.46	0.03
SABALOTE	milkfish	195,920	3.74	732,398.93	57,174.00	0.03
CAMARON VERDE	shrimp nd	29,399	23.76	698,658.59	54,540.09	0.03
GUACHITO	snapper	20,176	32.04	646,431.05	50,463.00	0.03
MERO	grouper	22,412	27.02	605,492.92	47,267.21	0.02
SABALO	milfish	110,498	5.44	600,655.79	46,889.60	0.02
MANTA	ray	75,813	7.29	552,698.70	43,145.88	0.02
PALOMETA	jack	84,492	5.73	484,303.00	37,806.64	0.02

Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar

Appendix 2, continued. Revenues Shrimp-fishing season Southern LECs.

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
LENGUADO	flatfish	30,931	15.35	474,858.09	37,069.33	0.02
OSTION	oyster	39,690	10.96	434,864.35	33,947.26	0.02
PARGO COCONACO	mexican barred snapper	16,262	25.46	414,036.96	32,321.39	0.02
LENGUA	cusk eel	25,400	14.42	366,386.30	28,601.58	0.01
CHABELITA	jack	95,017	3.23	307,272.72	23,986.94	0.01
CORVINA GRANIZA	corvina	46,728	6.44	301,158.87	23,509.67	0.01
MOJARRA ALETA AMARILLA	mojarra	29,099	9.21	268,126.50	20,931.03	0.01
PALETA	snook	12,336	21.59	266,391.91	20,795.62	0.01
LEBRANCHA	mullet	31,006	8.42	260,997.56	20,374.52	0.01
CHANO	croaker	20,525	8.25	169,256.88	13,212.87	0.01
JUREL	jack	21,727	6.59	143,237.26	11,181.68	0.01
TIBURON ANGELITO	angel shark	20,175	6.50	131,137.50	10,237.12	0.01
PAJARITO	needlefish	18,088	7.00	126,616.00	9,884.15	0.00
RAYA	ray	11,463	10.80	123,771.38	9,662.09	0.00
BOCA DULCE	croaker	17,471	6.66	116,306.94	9,079.39	0.00
CONEJO	tilefish	20,101	5.70	114,488.30	8,937.42	0.00
CORVINA BLANCA	corvina	8,159	13.95	113,855.14	8,887.99	0.00
MACABI	bonefish	15,420	7.32	112,809.47	8,806.36	0.00
PEPINO DE MAR	sea cucumber	9,919	10.00	99,190.00	7,743.17	0.00
TIBURON MARTILLO	hammerhead shark	5,460	17.31	94,500.00	7,377.05	0.00
PEZ GUITARRA	guitar fish	13,085	6.94	90,854.34	7,092.45	0.00
CHILE	lizard fish	21,749	4.12	89,636.95	6,997.42	0.00
ALMEJA	clam	30,740	2.60	79,924.00	6,239.19	0.00

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar

Appendix 2, continued. Revenues Shrimp-fishing season Southern LECs.

Species group						
Spanish common name	English common name	Total Landings(Kg) Shrimp-fishing season	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
MONA	spadefishes, batfishes and scats	9,791	6.46	63,283.29	4,940.15	0.00
BARRILETE	mackerel	29,268	2.03	59,286.46	4,628.14	0.00
PARGO LUNAJERO	spotted rose snapper	1,712	34.50	59,064.00	4,610.77	0.00
CAMARON BLANCO	white shrimp	1,745	31.67	55,258.33	4,313.69	0.00
CABRILLA	grouper	2,266	21.50	48,719.00	3,803.20	0.00
CORVINA RAYADA	corvina	1,994	21.00	41,874.00	3,268.85	0.00
TIBURON TRIPA	hound shark	3,482	10.82	37,668.91	2,940.59	0.00
CHOPA	chub	3,314	11.24	37,243.05	2,907.34	0.00
MONDA	jack	2,500	9.77	24,423.08	1,906.56	0.00
GAVILAN	ray	3,174	7.25	23,011.50	1,796.37	0.00
CONDOR	sea catfish	3,749	6.09	22,834.82	1,782.58	0.00
LANGOSTA ROJA	red lobster	218	100.00	21,800.00	1,701.80	0.00
FLAMENCO	snapper	703	29.38	20,650.63	1,612.07	0.00
PICUDA	barracuda	4,932	3.55	17,496.86	1,365.87	0.00
BOTA	triggerfish	1,911	7.21	13,779.32	1,075.67	0.00
PIERNA	tilefish	2,682	5.00	13,410.00	1,046.84	0.00
LORO	parrotfish	1,540	5.69	8,766.15	684.32	0.00
CORVINA ALETA AMARILLA	corvina	280	31.00	8,680.00	677.60	0.00
MOJARRA PIEDRERA	mojarra	2,290	3.50	8,015.00	625.68	0.00
RONCO	grunt	584	12.50	7,300.00	569.87	0.00
RATON	croaker	1,671	4.07	6,795.40	530.48	0.00
CORVINA CHATA	corvina	249	18.38	4,575.38	357.17	0.00
BARRACUDO	barracuda	500	8.00	4,000.00	312.26	0.00

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dolla

Appendix 2, continued. Revenues Shrimp-fishing season Southern LECs.

Species group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing season	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CUBERA	snapper	200	20.00	4,000.00	312.26	0.00
GALLINA	grouper	780	4.33	3,380.00	263.86	0.00
CULEBRA	pipefish	490	6.00	2,940.00	229.51	0.00
PISTOLA	triggerfish	393	5.00	1,965.00	153.40	0.00
MOJARRA PINTA	mojarra	350	5.00	1,750.00	136.61	0.00
TIBURON GATA	nurse shark	336	5.00	1,680.00	131.15	0.00
PERICO	parrotfish	340	4.78	1,624.44	126.81	0.00
BAYA	grouper	316	5.00	1,580.00	123.34	0.00
PARGO JOSELILLO	snapper	164	9.40	1,541.60	120.34	0.00
MOJARRON	grunt	200	7.00	1,400.00	109.29	0.00
VERDILLO	grouper	600	2.00	1,200.00	93.68	0.00
INDIO	nd	290	4.00	1,160.00	90.55	0.00
PAPELILLO	jack	383	2.83	1,085.17	84.71	0.00
ALMEJA VOLADORA	clam	150	7.00	1,050.00	81.97	0.00
CORCOVADO	grunt	50	20.00	1,000.00	78.06	0.00
CARACOL BURRO	Pacific crown conch	66	13.00	858.00	66.98	0.00
COCINERO	jack	100	6.00	600.00	46.84	0.00
BONITO	bonito	125	4.75	593.75	46.35	0.00
COCHINITO	triggerfish	70	8.00	560.00	43.72	0.00
MACHORRO	totoaba	62	8.00	496.00	38.72	0.00
SALMON	tilefish	90	5.00	450.00	35.13	0.00
CABALLO	jack	56	6.67	373.33	29.14	0.00
MOJARRA MUELUDA	mojarra	69	5.25	362.25	28.28	0.00
CHULA	grunt	120	3.00	360.00	28.10	0.00
OJOTON	jack	80	3.67	293.33	22.90	0.00
VACA	jack	40	7.00	280.00	21.86	0.00
MEDREGAL	jack	20	11.67	233.33	18.21	0.00
CHIVO	goatfish	40	3.00	120.00	9.37	0.00
Grand Total		87,405,834	22.36	2,581,510,858.83	201,523,095.93	2.23
						Diversity Revenue value

Appendix 2, continued. Revenues Shrimp-fishing ban Southern LECs.

Specis group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
CAMARON	shrimp	4,416,027	39.64	175,043,739.95	13,664,616.70	32.33
JAIBA	blue crab	6,109,748	12.72	77,726,329.91	6,067,629.19	14.36
OSTION DE PLACER	pleasure oyster	3,362,137	12.29	41,315,222.93	3,225,232.08	7.63
BOTETE	triggerfish	642,458	35.04	22,510,343.49	1,757,247.74	4.16
ROBALO	snook	560,151	38.79	21,728,644.75	1,696,225.20	4.01
PARGO	snapper	635,258	32.41	20,589,852.05	1,607,326.47	3.80
CORVINA	corvina	1,012,530	19.74	19,988,935.22	1,560,416.49	3.69
LISA	mullet	2,320,102	7.13	16,548,320.21	1,291,828.28	3.06
CAZON	hound shark	661,054	18.38	12,153,143.08	948,723.11	2.24
SIERRA	sierra	1,098,940	10.33	11,355,522.05	886,457.61	2.10
MANTARRAYA	mantaray	850,258	13.34	11,341,946.81	885,397.88	2.09
CHIHUIL	sea catfish	1,668,198	6.74	11,237,400.79	877,236.60	2.08
CAMARON DE ESTERO	estuarine shrimp	174,344	64.33	11,215,019.87	875,489.45	2.07
CALLO DE HACHA	scallop	80,430	132.77	10,679,039.13	833,648.64	1.97
MOJARRA	mojarra	1,095,427	7.34	8,043,923.98	627,940.98	1.49
LANGOSTA	lobster	58,843	124.12	7,303,544.38	570,143.98	1.35
GUACHINANGO	red snapper	287,145	24.60	7,064,465.59	551,480.53	1.30
ALMEJA BLANCA	white clam	1,937,828	3.22	6,237,890.44	486,954.76	1.15
BAGRE	sea catfish	544,555	11.05	6,017,642.55	469,761.32	1.11
BERRUGATA	croaker	562,747	8.29	4,664,739.46	364,148.28	0.86
TIBURON	shark	369,753	11.16	4,124,680.34	321,989.10	0.76
CONSTANTINO	snook	224,240	14.57	3,266,959.25	255,031.95	0.60
BURRO	grunt	587,684	4.45	2,615,748.51	204,195.82	0.48
BAQUETA	grouper	141,129	17.37	2,451,666.32	191,386.91	0.45
OSTION DE ROCA	rock oyster	306,517	7.39	2,266,182.35	176,907.29	0.42
LISA MACHO	mullet	208,887	10.53	2,198,742.34	171,642.65	0.41
ALMEJA CHOCOLATA	chocolata clam	382,560	4.98	1,905,010.32	148,712.75	0.35
TIBURON ALETA	shark fin	14,562	129.17	1,880,925.00	146,832.55	0.35
MOJARRA PLATEADA	mojarra	209,077	7.80	1,630,652.32	127,295.26	0.30
LENGUADO	flatfish	63,695	19.73	1,256,659.25	98,099.86	0.23
BACOCO	grunt	77,261	15.42	1,191,602.35	93,021.26	0.22

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar

Appendix 2, continued. Revenues Shrimp-fishing ban Southern LECs.

Specis group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
BACOCO	grunt	77,261	15.42	1,191,602.35	93,021.26	0.22
PAJARITO	needlefish	208,620	5.64	1,175,832.34	91,790.19	0.22
DORADO	dolphinfish	94,598	11.00	1,040,372.35	81,215.64	0.19
COCHI	triggerfish	96,617	9.70	937,089.24	73,152.95	0.17
MOJARRA BLANCA	mojarra	71,473	11.96	854,868.90	66,734.50	0.16
ALMEJA PATA DE MULA	mangrove cockle	120,220	5.65	679,643.73	53,055.72	0.13
MOYA	prawn	73,855	9.15	675,859.13	52,760.28	0.12
LISETA	mullet	141,986	4.69	665,456.43	51,948.20	0.12
BANDERA	sea catfish	146,644	4.47	656,111.42	51,218.69	0.12
PAMPANO	pampano	72,300	8.45	610,910.74	47,690.14	0.11
MOJARRA CHINA	mojarra	83,269	7.28	606,501.52	47,345.94	0.11
RONCACHO	grunt	78,821	7.31	576,322.71	44,990.06	0.11
MERO	grouper	19,223	28.90	555,454.12	43,360.98	0.10
SABALOTE	milkfish	93,220	4.43	412,567.72	32,206.69	0.08
GUACHITO	snapper	11,662	31.30	365,000.14	28,493.38	0.07
PARGO COCONACO	mexican barred snapper	12,341	29.40	362,800.21	28,321.64	0.07
MONA	spadefishes, batfishes and scats	46,968	7.05	331,067.12	25,844.43	0.06
MANTA	ray	37,789	7.92	299,273.02	23,362.45	0.06
LENGUA	cusk eel	22,038	12.64	278,516.24	21,742.10	0.05
SABALO	milkfish	47,066	5.77	271,583.54	21,200.90	0.05
CHABELITA	jack	74,603	3.36	250,366.05	19,544.58	0.05
CORVINA GRANIZA	corvina	31,853	7.45	237,164.56	18,514.02	0.04
PALOMETA	jack	37,602	5.44	204,460.88	15,961.04	0.04
TIBURON TORO	requiem shark	44,941	3.89	174,729.12	13,640.06	0.03
PAYASO	grouper	8,679	19.20	166,636.80	13,008.34	0.03
PEPINO DE MAR	sea cucumber	14,173	10.00	141,730.00	11,064.01	0.03
PALETA	snook	6,360	21.62	137,497.14	10,733.58	0.03
TIBURON MARTILLO	hammerhead shark	8,105	16.25	131,706.25	10,281.52	0.02

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 2, continued. Revenues Shrimp-fishing ban Southern LECs.

Specis group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
PEZ GUITARRA	guitar fish	19,161	6.57	125,915.14	9,829.44	0.02
CORVINA BLANCA	corvina	7,649	16.16	123,573.84	9,646.67	0.02
RAYA	ray	9,753	10.66	103,930.41	8,113.22	0.02
TIBURON TRIPA	hound shark	10,113	9.55	96,533.18	7,535.77	0.02
MOJARRA ALETA AMARILLA	mojarra	10,380	9.08	94,218.46	7,355.07	0.02
CONDOR	sea catfish	10,513	5.62	59,034.54	4,608.47	0.01
JUREL	jack	7,220	6.73	48,570.91	3,791.64	0.01
CHANO	croaker	5,655	7.81	44,152.50	3,446.72	0.01
MACABI	bonefish	8,200	5.33	43,733.33	3,414.00	0.01
OSTION	oyster	5,513	6.50	35,834.50	2,797.38	0.01
CHILE	lizard fish	8,482	3.74	31,711.98	2,475.56	0.01
TIBURON ANGELITO	angel shark	3,130	7.75	24,257.50	1,893.64	0.00
CABRILLA	grouper	1,588	15.25	24,217.00	1,890.48	0.00
BARRILETE	mackerel	12,612	1.80	22,751.06	1,776.04	0.00
BOCA DULCE	croaker	2,254	8.47	19,092.71	1,490.45	0.00
BOTA	triggerfish	1,746	9.70	16,936.20	1,322.11	0.00
CORVINA CHATA	corvina	836	18.00	15,048.00	1,174.71	0.00
PARGO LUNAJERO	spotted rose snapper	397	31.25	12,406.25	968.48	0.00
PICUDA	barracuda	1,690	6.78	11,454.44	894.18	0.00
CONEJO	tilefish	1,903	5.95	11,322.85	883.91	0.00
TAMBOR	pufferfish	577	17.50	10,097.50	788.25	0.00
GAVILAN	ray	1,263	6.72	8,490.17	662.78	0.00
LORO	parrotfish	1,372	5.92	8,120.76	633.94	0.00
CAMARON BOTALON	shrimp	950	7.33	6,966.67	543.85	0.00
RATON	croaker	1,624	4.25	6,902.00	538.80	0.00
CORVINA ALETA AMARILLA	corvina	190	30.00	5,700.00	444.96	0.00
CHOPA	chub	415	12.50	5,187.50	404.96	0.00
BONITO	bonito	2,000	2.50	5,000.00	390.32	0.00

Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar

Appendix 2, continued. Revenues Shrimp-fishing ban Southern LECs.

Specis group						
Spanish common name	English common name	Total Landings (Kg) Shrimp-fishing ban	Average price (pesos)	Revenues Mexican Pesos	*Revenues $US dollars	Percent
VERDILLO	grouper	550	7.50	4,125.00	322.01	0.00
MONDA	jack	520	6.00	3,120.00	243.56	0.00
MARLIN	billfish	270	10.50	2,835.00	221.31	0.00
COCHINITO	triggerfish	243	8.00	1,944.00	151.76	0.00
RONCO	grunt	385	5.00	1,925.00	150.27	0.00
CARDENAL	grouper	100	15.00	1,500.00	117.10	0.00
PAPELILLO	jack	375	2.50	937.50	73.19	0.00
PEZ GALLO	rooster fish	106	7.25	768.50	59.99	0.00
MOJARRON	grunt	100	7.00	700.00	54.64	0.00
PERICO	parrotfish	25	25.00	625.00	48.79	0.00
BARRILETE NEGRO	mackerel	300	2.00	600.00	46.84	0.00
VIEJA	wrass	119	5.00	595.00	46.45	0.00
MOJARRA PEINETA	mojarra	89	5.00	445.00	34.74	0.00
GALLINA	grouper	111	4.00	444.00	34.66	0.00
CHIVO	goatfish	43	10.00	430.00	33.57	0.00
SALMON	tilefish	55	7.00	385.00	30.05	0.00
TIBURON GATA	nurse shark	35	10.00	350.00	27.32	0.00
MORENA	morey eels	40	8.00	320.00	24.98	0.00
MEDREGAL	jack	20	15.00	300.00	23.42	0.00
PARGO AMARILLO	yellow snapper	15	20.00	300.00	23.42	0.00
PARGO JOSELILLO	snapper	24	10.00	240.00	18.74	0.00
FLAMENCO	snapper	6	25.00	150.00	11.71	0.00
MOJARRA MALACAPA	mojarra	16	6.00	96.00	7.49	0.00
BOTETE NEGRO	pufferfish	2	30.00	60.00	4.68	0.00
VACA	jack	20	2.00	40.00	3.12	0.00
Grand Total		32,509,326	17.14	541,398,410.81	42,263,732.30	7.05
						Diversity Revenue value

*Revenues in $US were calculated using $US 2012 average value of 12.81 pesos per 1$US dollar.

Appendix 3. Coastal states of Mexico's Pacific coast.

Coastal states of Mexico's Pacific coast: 1. Sonora, 2. Sinaloa, 3. Nayarit, 4. Jalisco, 5. Colima, 6. Michoacan, 7. Guerrero, 8. Oaxaca, 9. Chiapas