

Annotated checklist of the coastal ichthyofauna from Michoacán State, Mexico

Eloísa Torres-Hernández¹, Georgina Palacios-Morales¹,
Salvador Romero-Gallardo¹, Paloma Salazar-Araujo², Adrián García-Meraz¹,
Xavier Madrigal-Guridi¹, Luis F. Del Moral-Flores³, Omar Domínguez-Domínguez¹

1 Laboratorio de Biología Acuática Facultad de Biología Universidad Michoacana de San Nicolás de Hidalgo Ciudad Universitaria s/n Morelia Michoacán México **2** Posgrado de Ciencias del Mar y Limnología Unidad Académica Mazatlán Universidad Nacional Autónoma de México Apartado postal 811 Mazatlán 82000 Sinaloa México **3** Laboratorio de Zoología, Facultad de Estudios Superiores Iztacala, Universidad Nacional Autónoma de México, 54090 Tlalnepantla, Estado de México, México.

Corresponding author: Omar Domínguez (goodeido@yahoo.com.mx)

Academic editor: Kyle Piller | Received 25 April 2016 | Accepted 15 June 2016 | Published 21 July 2016

<http://zoobank.org/BA440377-5AE9-4FF6-8646-481C853449FE>

Citation: Torres-Hernández E, Palacios-Morales G, Romero-Gallardo S, Salazar-Araujo P, García-Meraz A, Madrigal-Guridi X, Del Moral-Flores LF, Domínguez-Domínguez O (2016) Annotated checklist of the coastal ichthyofauna from Michoacán State, Mexico. ZooKeys 606: 99–126. doi: 10.3897/zookeys.606.9004

Abstract

This study is the first to complete an intensive and comprehensive list of the ichthyofauna of nearly all ecosystems of the Michoacán coast, Mexico. The resulting systematic checklist, supplemented with information from the literature and scientific collections, comprises 440 species belonging to two classes, 31 orders, 104 families, and 264 genera. The families with the highest number of species were Sciaenidae (30 spp.), Carangidae (26), Haemulidae (24), Serranidae (21), Paralichthyidae, and Gobiidae (13). Of the total species list, 134 represent first records for the Michoacán State, and one is a first record for Mexico. The results expand the number of known fish species of the Michoacán coast by almost one third and will help to develop conservation and management plans for this coastal zone.

Keywords

Coastal fish, estuaries, marine, Mexican Central Pacific, systematic list

Introduction

Mexico has a wealth of both marine species and ecosystems. The country has the world's twelfth longest marine territory, including both Atlantic and Pacific oceans. The geographic and geological history, as well as the ecological and biological richness of areas such as the Gulf of California, the Oceanic islands, and the Caribbean, expands the diversity of Mexican marine life (Lara-Lara et al. 2008), including the ichthyofauna. The few studies pertaining to these taxa have primarily focused on conservation priority zones such as the Gulf of California (e.g. Del Moral-Flores et al. 2013), protected marine areas (e.g. Galván-Villa et al. 2016), or on economically important species (e.g. Lara-Lara et al. 2008).

The Mexican tropical Pacific is part of the biogeographic region known as the Tropical Eastern Pacific (TEP), which comprises three provinces: Cortez or Sinuscaliforniana, Mexican, and Panamic (*sensu* Briggs 1974). An estimated 1358 fish species occur in the TEP region, along with an additional of approximately 59 undescribed species (Zapata and Robertson, 2007). The TEP could be considered an area of low richness compared to other biogeographical regions of tropical seas, such as the Indo-Malaysian or the Great Caribbean. However, approximately 71% of identified TEP fish species are considered endemic, making it the tropical region with the highest rate of endemism per unit area in the world (Robertson and Allen 2015). According to Robertson and Allen (2015), the Cortez province possesses 9% of the 515 endemic fish species identified in the coastal ecosystems of the TEP region, whereas the Mexican and the Panamic provinces host 2% and 29% of the endemic component, respectively. Nine percent of the endemic species occur in both the Cortez and Mexican provinces, 10% in both the Mexican and the Panamic provinces, and 37% of the species are found in the three provinces. The endemic fish fauna of the five TEP oceanic islands (Revillagigedo, Galapagos, Cliperton, Coco, and Malpelo) represent, on the other hand, 10% of the total.

The Mexican province is highly productive due to the convergence of the Costa Rica Coastal Current and the California Current, favoring the presence of tropical, temperate, and transitional fish species (Kessler 2006). Based on its lower number of endemic fish species, the Mexican province has been considered a transition zone between the Cortez province in the north and the Panamic to the south (Hastings 2000, Palacios-Salgado 2005, Robertson and Cramer 2009). Attempts to characterize the ichthyofauna of this province are scarce, and most of them refer to a particular group of fishes, region or are based on unpublished reports (Madrid-Vera et al. 1998; Palacios-Salgado 2005, Madrigal-Guridi 2006, Moncayo-Estrada et al. 2006, Chávez-Comparan et al. 2008, López-Pérez et al. 2010, Márquez-Espinoza 2012, Sandoval-Huerta et al. 2012, 2012b, 2014; Palacios-Morales et al. 2014).

The coastline of the Michoacán State, in the Mexican province, is 261.5 km in length and runs from Boca de Apiza, at the mouth of the Coahuayana River, which represents the border with the Colima State to the north, to Barra de San Francisco, at the mouth of the Balsas River, which represents the border with the Guerrero State to the south (Correa and Gómez 2003). There are two contrasting physiographic zones

differing markedly in the marine ecosystems and consequently in the fish species present: (1) the municipalities of Lazaro Cardenas and Coahuayana, which are characterized by coastal plains, with a wide sandy coastline, mangroves, and estuary zones, (2) and the municipality of Aquila comprising numerous cliffs extending into the sea and forming wide zones of rocky reefs, coralline patches, and intertidal pools; estuaries in the last zone are scarce and differ in size and dynamism from those found in Lazaro Cardenas and Coahuayana (Correa and Gómez 2003).

Such heterogeneity in a transitional zone potentially produces high fish species richness. Nevertheless, information on the ichthyofauna of the Michoacán coast is limited, including two study focused on artisanal fishery species (Amezcu-Linares 2009, Sánchez-Aguilar 2007), two on estuarine fishes (Madrigal-Guridi 2006, Sandoval-Huerta et al. 2014) and one including all habitats (Medina-Nava et al. 2001). Madrid-Vera et al. (1998) published the previously most extensive list of the fish fauna of the Michoacán coast, with 257 species, 157 genera, and 76 families recorded in a wide variety of environments. This limited knowledge of the fish fauna contrasts with the importance of the fishery to the economy of the region as the main economic activity, with about 11,931 fishermen producing 6525 tons with an estimated economic value of 145,255,860 MXN (CONAPESCA 2014).

The main goal of this study was to provide an updated checklist of the ichthyofauna from the Michoacán coast including information on fish of local commercial importance and their biogeographic affinity. This knowledge will increase the understanding of regional fish diversity and could be of usefulness for conservation and management strategies of the littoral zone of the Central Mexican Pacific and particularly for the Michoacán State.

Materials and methods

The study area encompassed the coastline of Michoacán state, with 110 locations directly sampled (Fig. 1) and information on 50 additional sites obtained from published literature or scientific collections. These data were obtained through extensive review of the biological material deposited at the Colección de Peces de la Universidad Michoacana de San Nicolás de Hidalgo (**CPUM**), the Colección Nacional de Peces (**UNAM**), the Colección Ictiológica del Instituto de Ciencias del Mar y Limnología (**UNAM**) and the Marine Vertebrate Collection, Scripps Institute of Oceanography (**SIO**). In addition, records from the data base of the fish collection of the California Academy of Sciences (**CAS**) were reviewed. These investigation also included an extensive review of specialized publications (books, catalogues, and field guides) and reports of specimens deposited in ichthyological collections recognized by the Secretaria de Medio Ambiente y Recursos Naturales, México, or specimens of which identification was corroborated by experts.

Field sampling was conducted bimonthly from February 2010 to February 2011, with intermittent sampling in the ensuing year. Sampling was carried out in estuarine

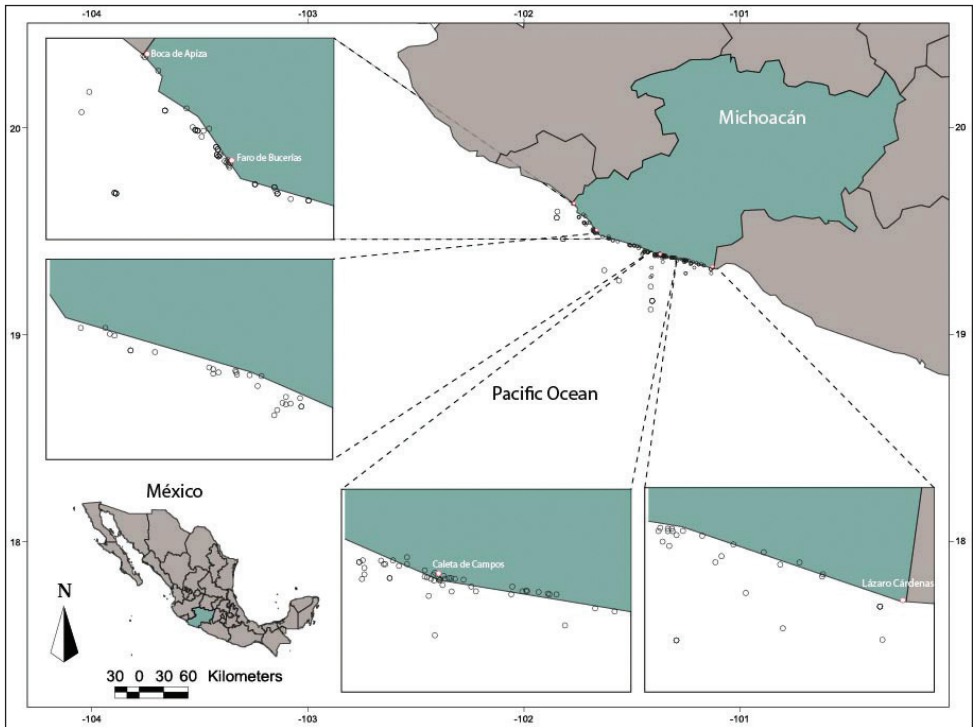


Figure 1. Sampling locations on the coast of Michoacán State.

zones, rocky intertidal pools, rocky reefs, sandy areas, coralline communities, artificial reefs, and the demersal-pelagic area. Methods were tailored to the ecosystem. Reef species were collected via SCUBA diving using elastic band harpoons. Ecologically cryptic (*sensu* Viesca-Lobatón 2005) and intertidal pool species were collected using eugenol (clove oil) anesthetic at a ratio of 1:5 (eugenol:ethanol) for reef and 0.25:9.75 for intertidal pool species. When the organisms were sedated, they were captured with a slurp gun or hand net. For estuarine locations, nocturnal sampling was done using gill nets (12 × 1.8 m and 0.7 to 1.2 cm mesh) and cast nets. For sandy-bottomed sites, a small fishing net (2 × 1.8 m, 1 cm mesh and 3 m bag) was used using a dragging period of 20 min. Captures from a shrimp fishing boat were also analyzed. Aggregations of debris in the open sea were investigated to collect ocean species rarely found in coastal areas. Cooperation with local artisanal fishermen was established to review incidental and commercial catches. Fishermen used lines of 50, 100, and 200 m at 5, 20, and 40 m depth, with hooks of various sizes, fishing with fishhook at a maximum depth of 80 m and gillnets of 7 to 12 cm mesh size. Information about the commercial value and uses of the species also was recorded.

Most specimens were photographed upon collection; tissue samples were taken and deposited at the tissue collection of the CPUM. Specimens were fixed in 5% or 10% formalin neutralized with sodium borate and posteriorly preserved in 70% etha-

nol. Fishes were identified using the keys and descriptions from Springer (1962), Allen and Robertson (1991, 1992, 1998), Fisher et al. (1995), Castro-Aguirre et al. (1999), Hastings and Robertson (1999, 1999b), Thomson et al. (2000), Carpenter and Niem (2001), Miller and Stefanni (2001), Miller et al. (2005), and Robertson and Allen (2015). For some groups, specialized literature was required: Balistidae (Latreille 1804, Shaw 1804-1805, Jordan and Evermann 1900, Froese and Pauly 2003), Rhinobatidae (Himaya and Kumada 1940), Gerreidae (Benitez 2004), Atherinopsidae (Lavenberg and Chernoff 1995), Labrisomidae (Hubbs 1953; Springer 1959, Rosenblatt and Parr 1969, Rosenblatt and Taylor 1971), Blenniidae (Springer 1962), Chaenopsidae (Hastings and Robertson 1999), Tripterygiidae (Allen and Robertson 1991, 1992, Rosenblatt et al. 2013), and for the genera *Abudefduf* Forsskal, 1775 (Lessios et al. 1995), *Tomicodon* Brisout de Barneville, 1846, *Gobiesox* Lacepède, 1800 (Briggs 1955; Briggs and Miller 1960), and *Albula* Scopoli, 1777 (Pfeiler 2008). All specimens were deposited at CPUM (MICH-PEC-227-07-09).

The systematic arrangement followed Nelson et al. (2016). The current taxonomic status of each species was corroborated in Eschmeyer et al. (2016). The arrangement of the genera and species was in alphabetical order. In the systematic list, the habitat-type from which each species was collected and the scientific collection by which the specimen was identified, or the scientific document from which information of the specimen was obtained, are indicated.

Finally, a zoogeographical affinity analysis of the species, based on the biogeographical regionalization proposed by Briggs (1974, 1995), was made. Accordingly, the Tropical Eastern Pacific was divided into three provinces. The San Diegan province was also included, since some species tended to have a northern distribution.

Results

Sampling was performed in 13 intertidal pool sites, 20 rocky reef sites, three coralline communities, two artificial reefs, 22 estuarine ecosystems, and 50 soft bottom and open sea sites, collecting 6963 fishes.

The compiled systematic list of ichthyofauna of the Michoacán coast comprises 436 species belonging to two classes, 31 orders, 104 families, and 260 genera (Table 1). The families representing the greatest number of species were Sciaenidae (30), Carangidae (26), Haemulidae (24), Serranidae (21), and Paralichthyidae and Gobiidae (13). The genera with the highest number of species were *Lutjanus* Bloch, 1790 (9), *Carcharhinus* Blainville, 1816 (7), *Anchoa* Jordan and Evermann, 1927 (6), *Diplectrum* Holbrook, 1855 (6), and *Caranx* Lacepède, 1801 (5).

Of the total identified species, 69% were collected and deposited at the CPUM, 22% were obtained from literature records, 7.5% from the review of museum specimens, and 1% from databases of ichthyological collections (Table 1). In addition, seven species were recorded through video and photographic evidence: *Ginglymostoma unami* Del Moral Flores, Ramírez-Antonio, Angulo y Pérez-Ponce de León, 2015,

Table 1. Updated checklist of the coastal ichthyofauna from Michoacán, Mexico.

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
CLASS ELASMOBRANCHII				
ORDER ORECTOLOBIFORMES				
FAMILY GINGLYMOSTOMATIDAE				
<i>Ginglymostoma unami</i> Del Moral Flores, Ramírez-Antonio, Angulo y Pérez-Ponce de León, 2015	R	AA	2, 4, 6, CPUM	A
ORDER LAMNIFORMES				
FAMILY LAMINIDAE				
<i>Isurus oxyrinchus</i> Rafinesque, 1810		CT	1	
FAMILY ALOPIIDAE				
<i>Alopias pelagicus</i> Nakamura, 1935		AP	2	
<i>Alopias superciliosus</i> (Lowe, 1841)		CT	2	
ORDER CARCHARHINIFORMES				
FAMILY TRIAKIDAE				
<i>Mustelus lunulatus</i> Jordan & Gilbert, 1882	D	TEP	2, 6	
FAMILY CARCHARHINIDAE				
<i>Carcharhinus albimarginatus</i> (Rüppell, 1837)		CT	2	
<i>Carcharhinus brachyurus</i> (Günther, 1870)		CT	2	
<i>Carcharhinus cerdale</i> Gilbert, 1898		TEP	1, 2	
<i>Carcharhinus falciformis</i> (Müller & Henle, 1839)		CT	2	
<i>Carcharhinus leucas</i> (Müller & Henle, 1839)		CT	1, 2	
<i>Carcharhinus limbatus</i> (Müller & Henle, 1839)	D	CT	1, 2, 6, CPUM	C
<i>Carcharhinus obscurus</i> (Lesueur, 1818)		CT	1, 2	
<i>Galeocerdo cuvier</i> (Péron & Lesueur, 1822)		CT	1, 2	
<i>Nasolamia velox</i> (Gilbert, 1898)		TEP	2	
<i>Negaprion brevirostris</i> (Poey, 1868)		AA	1, 2	
<i>Rhizoprionodon longurio</i> (Jordan & Gilbert, 1882)	D	SP, TEP	1, 2, CPUM	C
FAMILY SPHYRNIDAE				
<i>Sphyrna lewini</i> (Griffith & Smith, 1834)	D	CT	1, 2, 4, 6, 9, CPUM	C
<i>Sphyrna zygaena</i> (Linnaeus, 1758)		CT	2	
ORDER TORPEDINIFORMES				
FAMILY NARCINIDAE				
<i>Narcine entemedor</i> Jordan & Starks, 1895	D	TEP	1, 9, CPUM	I
* <i>Narcine vermiculatus</i> Breder, 1928	D	MP, PP	6, 9, CPUM, ICMYL, CIBNOR	I
ORDER PRISTIFORMES				
FAMILY PRISTIDAE				
* <i>Pristis pristis</i> (Linnaeus, 1758)	PD	AA	CPUM-photo	C
ORDER RAJIFORMES				
FAMILY RHINOBATIDAE				
<i>Rhinobatos glaucostigma</i> Jordan & Gilbert, 1883	R	TEP	1, 2, 4, 6, 9, CPUM, ICMYL	C
<i>Rhinobatos productus</i> Ayres, 1856		SP, TEP	2	
* <i>Zapteryx xyster</i> Jordan & Evermann, 1896	R	TEP	CPUM, SIO	I

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
FAMILY RAJIDAE				
<i>Raja equatorialis</i> Jordan & Bollman, 1890		MP, PP	1	
ORDER MYLIOBATIFORMES				
FAMILY UROTRYGONIDAE				
<i>Urotrygon</i> aff. <i>aspidura</i> (Jordan & Gilbert, 1882)		TEP	1	
<i>Urotrygon chilensis</i> (Günther, 1872)		TEP	1, 2, 9	
<i>Urotrygon munda</i> Gill, 1863		TEP	2	
<i>Urotrygon nana</i> Miyake & McEachran, 1988		TEP	1, 9	
<i>Urotrygon rogersi</i> (Jordan & Starks, 1895)	PD	TEP	1, 4, 9, CPUM, SIO	I
FAMILY GYMNURIDAE				
<i>Gymnura marmonata</i> (Cooper, 1863)		SP, TEP	1, 9, CPUM	C
FAMILY MYLIOBATIDAE				
<i>Aetobatus laticeps</i> (Euphrasen, 1790)	R	CT	2, 4, CPUM-photo	I
FAMILY MYLIOBATIDAE				
* <i>Rhinoptera steindachneri</i> Evermann & Jenkins, 1891	PD	TEP	CPUM	I
FAMILY MOBULIDAE				
* <i>Mobula munkiana</i> Notarbartolo di Sciarra, 1987	PD	TEP	CPUM	C
FAMILY UROTRYGONIDAE				
<i>Urobatis concentricus</i> Osburn & Nichols, 1916	R	TEP	1, 6, CPUM	
<i>Urobatis halleri</i> (Cooper, 1863)	R	TEP	2, CPUM	
FAMILY DASYATIDAE				
<i>Dasyatis dipterura</i> (Jordan & Gilbert, 1880)	D	TEP	2, 9, CIBNOR	
<i>Dasyatis longus</i> (Garman, 1880)	PD	SP, TEP	1, CPUM	I
CLASS ACTINOPTERYGII				
ORDER ELOPIFORMES				
FAMILY ELOPIDAE				
<i>Elops affinis</i> Regan, 1909	E	SP, TEP	2, CPUM	C
ORDER ALBULIFORMES				
FAMILY ALBULIDAE				
<i>Albula pacifica</i> (Beebe, 1942)	D	MP, PP	1, 2, 9, CPUM	C
ORDER ANGUILLIFORMES				
FAMILY MURAENIDAE				
* <i>Echidna nocturna</i> (Cope, 1872)	PM, R	CP, MP	CPUM	
* <i>Enchelycore octaviana</i> (Myers & Wade, 1941)	PM, R	CP, MP	CPUM	
<i>Gymnomuraena zebra</i> (Shaw, 1797)	R	AP	2, 6, CPUM	I
<i>Gymnothorax castaneus</i> (Jordan & Gilbert, 1883)	PM, R	TEP	2, 6, CPUM	
* <i>Gymnothorax equatorialis</i> (Hildebrand, 1946)	R	TEP	9, CPUM	
* <i>Muraena argus</i> (Steindachner, 1870)		TEP	ICMYL	
<i>Muraena lentiginosa</i> Jenyns, 1842	PM, R	TEP	2, 4, 5, 9, CPUM	
* <i>Uropterygius macrocephalus</i> (Bleeker, 1864)	PM	TEP	CPUM	
FAMILY OPHICHTHIDAE				
* <i>Apterichthys equatorialis</i> (Myers & Wade, 1941)	R	TEP	CPUM	
* <i>Echiophis brunneus</i> (Castro-Aguirre & Suárez de los Cobos, 1983)	R	TEP	9, CPUM	
* <i>Myrichthys aspetocheiros</i> McCosker & Rosenblatt, 1993	R	CP, MP	6, CPUM	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Ophichthus triserialis</i> (Kaup, 1856)	R	TEP	2, CPUM, ICMYL	I
<i>Ophichthus zophochir</i> Jordan & Gilbert, 1882	R	TEP	1, 2, CPUM, ICMYL	I
FAMILY CONGRIDAE				
* <i>Ariosoma gilberti</i> (Ogilby, 1898)	D	MP, PP	9	
<i>Heteroconger digueti</i> (Pellegrin, 1923)		TEP	2	
* <i>Paraconger californiensis</i> Kanazawa, 1961		TEP	SIO	
* <i>Rhynchoconger nitens</i> (Jordan & Bollman, 1890)	D	TEP	9, CPUM, ICMYL	I
ORDER CLUPEIFORMES				
FAMILY CLUPEIDAE				
<i>Harengula thrissina</i> (Jordan & Gilbert, 1882)	PM	SP, TEP	2, 4, 6, 9, CPUM	A
<i>Lile gracilis</i> Castro-Aguirre & Vivero, 1990	E	MP, PP	1, 12, CPUM	
<i>Lile nigrofasciata</i> Castro-Aguirre, Ruiz-Campos & Balart, 2002	E	TEP	1, 10, 12, 13, CPUM	
<i>Lile stolidifera</i> (Jordan & Gilbert, 1882)	E	TEP	CPUM	
* <i>Opisthonema bulleri</i> (Regan, 1904)	PD	TEP	CPUM	A
<i>Opisthonema libertate</i> (Günther, 1867)	E	SP, TEP	2, 8, CPUM	A
* <i>Opisthonema medirastre</i> Berry & Barrett, 1963	PM	TEP	CPUM	A
FAMILY ENGRAULIDAE				
* <i>Anchoa argentivittata</i> (Regan, 1904)	PM	TEP	CPUM	A
<i>Anchoa ischana</i> (Jordan & Gilbert, 1882)		TEP	2, 5	
<i>Anchoa lucida</i> (Jordan & Gilbert, 1882)	E	TEP	2, 12, CPUM	
<i>Anchoa mundeola</i> (Gilbert & Pierson, 1898)		TEP	2	
* <i>Anchoa nasus</i> (Kner & Steindachner, 1867)	PM	TEP	CPUM, ICMYL	
<i>Anchoa scofieldi</i> (Jordan & Culver, 1895)	PD	MP, PP	2, 4, CPUM	A
* <i>Anchovia macrolepidota</i> (Kner, 1863)	PD	SP, TEP	CPUM	A
<i>Cetengraulis mysticetus</i> (Günther, 1867)	PD	TEP	2, CPUM	A
FAMILY PRISTIGASTERIDAE				
<i>Ilisha fuerthii</i> (Steindachner, 1875)		MP, PP	2, 7	
* <i>Opisthopterus dovii</i> (Günther, 1868)		TEP	8	
<i>Pliosteostoma lutipinnis</i> (Jordan & Gilbert, 1882)	E	TEP	1, 8, 9, 10, 12, 13, CPUM	A
ORDER GONORYNCHIFORMES				
FAMILY CHANIDAE				
<i>Chanos chanos</i> (Forsskål, 1775)	PD	CT	2, 7, CPUM	C
ORDER CYPRINIFORMES				
FAMILY CYPRINIDAE				
<i>Cyprinus carpio</i> Linnaeus, 1758	E	Introduced	CPUM	
ORDER SILURIFORMES				
FAMILY ARIIDAE				
<i>Bagre panamensis</i> (Gill, 1863)		TEP	2	
<i>Bagre pinnimaculatus</i> (Steindachner, 1876)		TEP	2	
<i>Catborops dasycephalus</i> (Günther, 1864)		MP, PP	2	
<i>Notarius kessleri</i> (Steindachner, 1877)		MP, PP	1, 2	
<i>Notarius planiceps</i> (Parr, 1931)		MP, PP	1, 2	
<i>Occidentarius platypogon</i> (Steindachner, 1877)	E, D	SP, TEP	1, 8, 9, CPUM	C
<i>Sciades guatemalensis</i> (Günther, 1864)	E	MP, PP	1, 2, CPUM	C
<i>Sciades seemanni</i> (Günther, 1864)		TEP	1, CNPE-IBUNAM	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
FAMILY LORICARIIDAE				
<i>Prerygoplichthys disjunctivus</i> (Weber, 1991)	E	Introduced	10, CPUM	
ORDER OSMERIFORMES				
FAMILY BATHYLAGIDAE				
* <i>Bathylagoides nigrigenys</i> Garman, 1899		MP, PP	SIO	
ORDER STOMIIFORMES				
FAMILY GONOSTOMATIDAE				
* <i>Cyclothone acclinidens</i> (Garman, 1899)		CT	SIO	
FAMILY PHOSICHTHYIDAE				
* <i>Vinciguerria lucetia</i> (Garman, 1899)		AP	SIO	
FAMILY STOMIIDAE				
* <i>Bathophilus filifer</i> Gilbert, 1890		AP	SIO	
* <i>Idiacanthus antrostomus</i> (Parr, 1929)		AP	SIO	
ORDER AULOPIFORMES				
FAMILY SCOPELARCHIDAE				
* <i>Scopelarchoides nicholsi</i> Jordan & Bollman, 1890		SP, TEP	SIO	
FAMILY SYNODONTIDAE				
* <i>Synodus evermanni</i> Gilbert, 1890	R	TEP	9, CPUM, SIO	I
* <i>Synodus lacertinus</i> Jordan & Gilbert, 1882	R	TEP	9, CPUM	
<i>Synodus scituliceps</i> Hildebrand, 1946		TEP	1, 2, 9, ICMYL	
* <i>Synodus sechurae</i> Parr, 1931	PD	TEP	CPUM	I
ORDER MYCTOPHIFORMES				
FAMILY MYCTOPHIDAE				
* <i>Diaphus pacificus</i> Hubbs, 1944		AP	CAS	
* <i>Diogenichthys laternatus</i> (Jordan & Bollman, 1890)		AP	CAS	
* <i>Lampanyctus omostigma</i> (Gilbert, 1890)		AP	CAS	
* <i>Lampanyctus parvicauda</i> Parr, 1931		AP	SIO	
* <i>Myctophum aurolaternatum</i> (Putnam, 1874)		AP	ANSP	
ORDER OPHIDIIFORMES				
FAMILY OPHIDIIDAE				
<i>Brotula clarkae</i> Hubbs, 1944		TEP	1	
* <i>Lepophidium prorates</i> (Jordan & Bollman, 1890)	D	TEP	9, SIO, ICMYL	
* <i>Otophidium indefatigabile</i> (Richardson, 1844)	D	TEP	9, ICMYL, CIBNOR	
FAMILY CARAPIDAE				
<i>Carapus dubius</i> (Putnam, 1874)		AP	1	
ORDER BATRACHOIDIFORMES				
FAMILY BATRACHOIDIDAE				
* <i>Batrachoides waltersi</i> Collette & Russo, 1981		MP, PP	ICMYL	
* <i>Porichthys ephippiatus</i> Walker y Rosenblatt, 1988		TEP	CPUM, SIO	I
* <i>Porichthys margaritatus</i> (Richardson, 1844)		TEP	9, CIBNOR	
ORDER LOPHIIFORMES				
FAMILY LOPHIIDAE				
<i>Lophiodes caulinaris</i> (Garman, 1899)		SP, TEP	1, 9, SIO, ICMYL	
<i>Lophiodes spilurus</i> (Garman, 1899)		TEP	1	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
FAMILY ANTENNARIIDAE				
<i>*Antennatus sanguineus</i> (Gill, 1863)		SP, TEP	6	
<i>*Antennatus strigatus</i> (Gill, 1863)	R	TEP	6, CPUM, ICMYL	
<i>*Fowlerichthys avalonis</i> (Bancroft, 1834)	R	SP, TEP	6, 9, CPUM	
FAMILY OGCOEPHALIDAE				
<i>Zalientes elater</i> (Jordan y Gilbert, 1882)	PD	SP, TEP	1, 2, 9, CPUM, SIO, ICMYL	I
ORDER GOBIESOCIFORMES				
FAMILY GOBIESOCIDAE				
<i>*Arcos erythropros</i> (Jordan & Gilbert, 1882)	PM, R	CP, MP	CPUM	
<i>*Gobiesox adustus</i> Jordan & Gilbert, 1882	PM, R	TEP	CPUM	
<i>Gobiesox mexicanus</i> Briggs & Miller, 1960	E	Freshwater	CPUM	
<i>*Tomicodon petersii</i> (Garman, 1875)	R	MP, PP	CPUM	
<i>Tomicodon zebra</i> (Jordan & Gilbert, 1882)	PM	CP, MP	2, CPUM	
ORDER ATHERINIFORMES				
FAMILY ATHERINOPSIDAE				
<i>*Atherinella eriarcha</i> Jordan y Gilbert, 1882	PM	TEP	4, CPUM, CNPE-IBUNAM	
<i>Atherinella guatemalensis</i> (Günther, 1864)	E	MP, PP	1, 8, 12, CPUM, CNPE-IBUNAM	
<i>Atherinella panamensis</i> Steindachner, 1875	E	MP, PP	8, 10, 12, CPUM	
ORDER CYPRINODONTIFORMES				
FAMILIA POECILIDAE				
<i>Poecilia butleri</i> Jordan, 1889	E	Freshwater	8, 10, 12, 13, CPUM	
ORDER BELONIFORMES				
FAMILY BELONIDAE				
<i>Platybelone argalus</i> (Lesueur, 1821)		CT	2, SIO, ANSP	
<i>Strongylura exilis</i> (Girard, 1854)		SP, TEP	2, 6	
<i>Tylosurus fodiator</i> Jordan y Gilbert, 1882	PD	TEP	2, CPUM	C
FAMILY HEMIRAMPHIDAE				
<i>Hemiramphus saltator</i> Gilbert & Starks, 1904	PD	TEP	1, 6, CPUM	
<i>Hyporhamphus naos</i> Banford & Collette, 2001	PD	TEP	1, CPUM	A
<i>*Oxyporhamphus micropterus</i> (Valenciennes, 1847)		CT	SIO	
FAMILY EXOCOETIDAE				
<i>*Cheilopogon furcatus</i> (Mitchill, 1815)		CT	SIO	
<i>*Cheilopogon papilio</i> (Clark, 1936)		SP, CB, MP	SIO	
<i>Cypselurus callopterus</i> (Günther, 1866)		SP, CB, MP	1, 2, SIO	
<i>*Exocoetus monocirrhus</i> Richardson, 1846		AP	SIO	
<i>Fodiator rostratus</i> (Günther, 1866)		TEP	2, SIO	
<i>*Prognichthys tringa</i> Breder, 1928		AP	SIO	
ORDER STEPHANOBERYCIFORMES				
FAMILY MELAMPHIDAE				
<i>*Scopelogadus mizolepis</i> (Günther, 1878)		CT	CAS	
ORDER BERYCIFORMES				
FAMILY HOLOCENTRIDAE				
<i>Sargocentron suborbitale</i> (Gill, 1863)	PM, R	TEP	2, 4, 5, 6, CPUM, SIO, ICMYL	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Myripristis leiognathus</i> Valenciennes, 1846	R	SR, TEP	2, 5, 6, 9, CPUM	
ORDER SYNGNATHIFORMES				
FAMILY FISTULARIIDAE				
<i>Fistularia commersonii</i> Rüppell, 1838	R	AP	1, 2, 6, CPUM	
* <i>Fistularia corneta</i> Gilbert & Starks, 1904	R	SR, TEP	CPUM	
FAMILY SYNGNATHIDAE				
* <i>Doryrhamphus excisus</i> Kaup, 1856	R	AP	CPUM	
<i>Hippocampus ingens</i> Girard, 1858	R	SR, TEP	1, 2, 6, 9, CPUM, ICMYL	
<i>Pseudophallus starksi</i> (Jordan & Culver, 1895)	E	TEP	1, 12, CPUM, CNPE-IBUNAM	
ORDER SCORPAENIFORMES				
FAMILY SCORPAENIDAE				
<i>Scorpaena histrio</i> Jenyns, 1840		TEP	2	
<i>Scorpaena mystes</i> (Jordan & Starks, 1895)	R	AA	1, 6, 9, CPUM, ICMYL	I
<i>Scorpaena russula</i> Jordan & Bollman, 1890		TEP	1, 9	
* <i>Scorpaena sonoroae</i> Jenkins & Evermann, 1889	PD	CP, PP	CPUM	I
* <i>Scorpaenodes xyris</i> (Jordan & Gilbert, 1882)	R	SR, TEP	CPUM	
FAMILY TRIGLIDAE				
* <i>Bellator gymnoethus</i> (Gilbert, 1892)		TEP	9	
<i>Bellator loxias</i> (Jordan, 1897)		TEP	2	
<i>Bellator xenisma</i> (Jordan & Bollman, 1890)		TEP	1, 2, 9	
<i>Prionotus albirostris</i> Jordan & Bollman, 1890		TEP	1, 9	
<i>Prionotus horrens</i> Richardson, 1844		TEP	1	
<i>Prionotus ruscarius</i> Gilbert & Starks, 1904	R	SR, TEP	1, 2, 9, CPUM, SIO	A
<i>Prionotus stephanophrys</i> Lockington, 1881	R	SR, TEP	1, 2, 9, CPUM, ICMYL	A
ORDER PERCIFORMES				
FAMILY CENTROPOMIDAE				
<i>Centropomus armatus</i> Gill, 1863	PD	MP, PP	2, 7, 8, CPUM	C
<i>Centropomus medius</i> Günther, 1864	PD	SR, TEP	1, 2, CPUM	C
<i>Centropomus nigrescens</i> Günther, 1864	E	TEP	2, 4, 10, 12, 13, CPUM	C
<i>Centropomus robalito</i> Jordan & Gilbert, 1882	E	TEP	2, 3, CPUM	
<i>Centropomus viridis</i> Lockington, 1877	E	TEP	1, 2, 3, 7, 8, CPUM	
FAMILY SERRANIDAE				
<i>Alphestes immaculatus</i> Breder, 1936	R	TEP	2, 6, CPUM	I
<i>Alphestes multiguttatus</i> (Günther, 1867)	R	TEP	2, 4, 5, 6, CPUM	I
<i>Cephalopholis panamensis</i> (Steindachner, 1877)	R	TEP	2, 4, 6, CPUM	
<i>Dermatolepis dermatolepis</i> (Boulenger, 1895)	R	TEP	2, 6, CPUM-photo	
<i>Diplectrum eumelum</i> Rosenblatt & Johnson, 1974	R	TEP	1, 9, CPUM, SIO	
* <i>Diplectrum euryplectrum</i> Jordan & Bollman, 1890	R	TEP	CPUM, ICMYL	
<i>Diplectrum labarum</i> Rosenblatt & Johnson, 1974	R	TEP	1, 9, CPUM, SIO	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Diplectrum macropoma</i> (Günther, 1864)	R	TEP	1, CPUM, SIO	
<i>Diplectrum pacificum</i> Meek & Hildebrand, 1925	R	TEP	2, 4, 6, 9, CPUM	
* <i>Diplectrum rostrum</i> Bortone, 1974	PD	TEP	CPUM	A
<i>Epinephelus analogus</i> Gill, 1863	R	SP, TEP	1, 2, 4, 6, 9, CPUM, ICMYL, CNPE-IBUNAM	C
<i>Epinephelus labriformis</i> (Jenyns, 1840)	PM, R	TEP	1, 2, 4, 6, 9, CPUM	C
<i>Hyporthodus acanthistius</i> (Gilbert, 1892)	R	TEP	1, 2, 4, 9, CPUM, ICMYL	C
* <i>Hyporthodus exsul</i> (Fowler, 1944)		TEP	SIO	
<i>Hyporthodus niphobles</i> Gilbert & Starks, 1897	R	SP, TEP	1, CPUM	C
* <i>Paralabrax lora</i> Walford, 1936	R	TEP	9, CPUM	C
<i>Paranthias colonus</i> (Valenciennes, 1846)	R	TEP	2, 6, CPUM, ICMYL	C
* <i>Pseudogramma thaumasia</i> (Gilbert, 1900)	R	TEP	CPUM	
<i>Rypticus bicolor</i> Valenciennes, 1846	PM, R	TEP	1, CPUM	A
* <i>Rypticus nigripinnis</i> Gill, 1861		TEP	9, ICMYL	
<i>Serranus psittacinus</i> Valenciennes, 1846		TEP	2	
FAMILY PRIACANTHIDAE				
<i>Heteropriacanthus cruentatus</i> (Lacepède, 1801)		CT	2, 6	
<i>Pristigenys serrula</i> (Gilbert, 1891)	D	TEP	1, 2, 6, 9, CPUM	
FAMILY APOGONIDAE				
<i>Apogon pacificus</i> (Herre, 1935)	R	TEP	1, 6, CPUM-photo, ICMYL	
<i>Apogon retrosella</i> (Gill, 1862)	PM, R	TEP	2, 6, CPUM	
FAMILY ECHENEIDAE				
* <i>Phtheichthys lineatus</i> (Menziés, 1791)		CT	ANSP	
* <i>Remora osteochir</i> (Cuvier, 1829)		CT	SIO	
<i>Remora remora</i> (Linnaeus, 1758)	D	CT	2, CPUM, CNPE-IBUNAM	
FAMILY CARANGIDAE				
<i>Alectis ciliaris</i> (Bloch, 1787)	PD	CT	1, 2, 9, CPUM	C
<i>Carangoides otrynter</i> (Jordan & Gilbert, 1883)	R	SP, TEP	1, 2, 4, CPUM, ICMYL	C
<i>Carangoides vinctus</i> Jordan & Gilbert, 1882	D	SP, TEP	1, 2, 9, CPUM, ICMYL, CNPE-IBUNAM	C
<i>Caranx caballus</i> Günther, 1868	PM, R	SP, TEP	1, 2, 4, 6, CPUM, ICMYL	C
<i>Caranx caninus</i> Günther, 1867	R, E	SP, TEP	1, 2, 9, 12, CPUM, SIO, CIBNOR	C
<i>Caranx lugubris</i> Poey, 1860	PD	TEP	2, CPUM	C
<i>Caranx melampygus</i> Cuvier, 1833		CT	2, 6	
<i>Caranx sexfasciatus</i> Quoy & Gaimard, 1825	R, E	AP	2, 7, 8, CPUM	C
<i>Chloroscombrus orqueta</i> Jordan & Gilbert, 1883	PM	SP, TEP	1, 2, 9, CPUM, CNPE-IBUNAM	A
* <i>Decapterus macrosoma</i> Bleeker, 1851	PD	AP	CPUM	C
<i>Decapterus muroadsi</i> (Temminck & Schlegel, 1844)		CT	1, 2	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Elagatis bipinnulata</i> (Quoy & Gaimard, 1825)	PD	CT	1, 2, CPUM	C
<i>Gnathanodon speciosus</i> (Forskål, 1775)		AP	2	
<i>Hemicaranx leucurus</i> (Günther, 1864)		TEP	2	
<i>Hemicaranx zelotes</i> Gilbert, 1898		TEP	2, 7	
<i>Oligoplites altus</i> (Günther, 1868)	PD	TEP	2, CPUM	C
<i>Oligoplites refulgens</i> Gilbert & Starks, 1904	PD	TEP	2, CPUM	C
<i>Oligoplites saurus</i> (Bloch & Schneider, 1801)	E	TEP	2, CPUM	
<i>Selar crumenophthalmus</i> (Bloch, 1793)	R, E	CT	1, 2, 8, CPUM, SIO	C
<i>Selene brevoortii</i> (Gill, 1863)	R, E	SP, TEP	1, 2, CPUM	A
<i>Selene peruviana</i> (Guichenot, 1866)	R	TEP	1, 2, 9, CPUM	A
<i>Seriola peruana</i> Steindachner, 1881	R	TEP	2, CPUM	C
<i>Seriola rivoliana</i> Valenciennes, 1833	PD	CT	2, CPUM	C
* <i>Trachinotus kennedyi</i> Steindachner, 1876	E	TEP	2, CPUM, CNPE-IBUNAM	
<i>Trachinotus patiensis</i> Cuvier, 1832		TEP	1, 2	
<i>Trachinotus rhodopus</i> Gill, 1863	PM, R, E	SP, MP, PP	1, 2, 4, 6, 7, 12, CPUM, ICMYL	
FAMILY NEMATISTIIDAE				
<i>Nematistius pectoralis</i> Gill, 1862	PD	TEP	2, 4, CPUM	C
FAMILY CORYPHAENIDAE				
* <i>Coryphaena equiselis</i> Linnaeus, 1758		CT	SIO	
<i>Coryphaena hippurus</i> Linnaeus, 1758	PD	CT	2, 4, CPUM-photo	C
FAMILY LUTJANIDAE				
<i>Hoplopagrus guentherii</i> Gill, 1862	R	SP, TEP	1, 2, 6, CPUM	C
<i>Lutjanus aratus</i> (Günther, 1864)		TEP	1	
<i>Lutjanus argentiventris</i> (Peters, 1869)	PM, R, E	SP, TEP	1, 2, 6, 12, CPUM, CNPE-IBUNAM	C
<i>Lutjanus colorado</i> Jordan & Gilbert, 1882	R, E	SP, TEP	1, 2, 4, 6, 8, CPUM	C
<i>Lutjanus guttatus</i> (Steindachner, 1869)	R	TEP	1, 2, 4, 6, CPUM, SIO, ICMYL	C
<i>Lutjanus inermis</i> (Peters, 1869)	R	TEP	1, 2, CPUM, ICMYL	C
* <i>Lutjanus jordani</i> (Gilbert, 1898)		TEP	6	
<i>Lutjanus novemfasciatus</i> Gill, 1862	PM, R, E	SP, TEP	1, 2, 4, 6, 7, 8, 10, 12, 13, CPUM	C
<i>Lutjanus peru</i> (Nichols & Murphy, 1922)	R	SP, TEP	1, 2, 4, 9, CPUM, ICMYL	C
* <i>Lutjanus viridis</i> (Valenciennes, 1846)	PD	TEP	6, CPUM	
FAMILY LOBOTIDAE				
<i>Lobotes pacificus</i> Gilbert, 1898	PD	CT	1, CPUM	C
FAMILY GERREIDAE				
<i>Deckereichthys aureolus</i> (Jordan & Gilbert, 1882)	D	TEP	1, 2, 9, CPUM, ICMYL	C
<i>Diapterus brevirostris</i> (Sauvage, 1879)	E	TEP	1, 2, CPUM	C
<i>Eucinostomus currani</i> Zahuranec, 1980	PM, E	SP, TEP	1, 2, 7, 8, 9, 10, 12, 13, CPUM, CNPE-IBUNAM	C
<i>Eucinostomus dowii</i> (Gill, 1863)		SP, TEP	1	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>*Eucinostomus entomelas</i> Zahuranec, 1980		SP, TEP	CNPE-IBUNAM	
<i>Eucinostomus gracilis</i> (Gill, 1862)		TEP	1, 2, 9	
<i>*Eugerres axillaris</i> (Günther, 1864)	R, E	TEP	CPUM	
<i>Eugerres brevimanus</i> (Günther, 1864)		MP, PP	1	
<i>*Eugerres lineatus</i> (Humboldt, 1821)	E	TEP	CPUM	
<i>Gerres simillimus</i> Reagan, 1907	R, E	TEP	1, 2, 4, 7, CPUM	C
FAMILY HAEMULIDAE				
<i>*Anisotremus caesius</i> (Jordan & Gilbert, 1882)	R	MP, PP	CPUM, CNPE-IBUNAM	C
<i>Anisotremus interruptus</i> (Gill, 1862)	R	SP, TEP	1, 2, 4, 6, CPUM, ICMYL, CNPE-IBUNAM	C
<i>Anisotremus taeniatus</i> Gill, 1861	R	SP, TEP	2, 6, CPUM	C
<i>Conodon serrifer</i> Jordan & Gilbert, 1882		SP, TEP	1, ICMYL	
<i>Genyatremus dovii</i> (Günther, 1864)	R	TEP	2, CPUM, ICMYL, CNPE-IBUNAM	C
<i>Genyatremus pacifici</i> (Günther, 1864)		MP, PP	2	
<i>Haemulon californiensis</i> (Steindachner, 1876)		TEP	2	
<i>Haemulon flaviguttatum</i> Gill, 1862	R	SP, TEP	1, 2, 4, 6, CPUM, ICMYL	C
<i>Haemulon maculicauda</i> (Gill, 1862)	R	SP, TEP	2, 6, CPUM, ICMYL	C
<i>Haemulon scudderii</i> Gill, 1862	R	SP, TEP	1, 2, CPUM	C
<i>Haemulon sexfasciatum</i> Gill, 1862	R	TEP	1, 2, 6, CPUM	C
<i>Haemulon steindachneri</i> (Jordan & Gilbert, 1882)	R	AA	2, CPUM, ICMYL, CNPE-IBUNAM	C
<i>Haemulopsis axillaris</i> (Steindachner, 1869)	R	MP, PP	2, CPUM	C
<i>Haemulopsis elongatus</i> (Steindachner, 1879)	R	MP, PP	1, CPUM, ICMYL	C
<i>Haemulopsis leuciscus</i> (Günther, 1864)	E	TEP	1, 2, 6, 9, CPUM, CNPE-IBUNAM	C
<i>Haemulopsis nitidus</i> (Steindachner, 1869)	R	TEP	1, CPUM	
<i>*Microlepidotus brevipinnis</i> (Steindachner, 1869)	R	TEP	CPUM	C
<i>Orthopristis chalceus</i> (Günther, 1864)	R	TEP	2, 4, CPUM	
<i>Orthopristis reddingi</i> Jordan & Richardson, 1895	R	TEP	1, 2, CPUM	
<i>Pomadasy bayanus</i> Jordan & Evermann, 1898	E	TEP	1, 2, CPUM	
<i>Pomadasy branickii</i> (Steindachner, 1879)	E	TEP	1, 7, 10, CPUM, ICMYL	
<i>Pomadasy macracanthus</i> (Günther, 1864)	E	TEP	2, CPUM	
<i>Pomadasy panamensis</i> (Steindachner, 1876)		TEP	1, 2, 9, CNPE-IBUNAM	C
<i>Xenichthys xanti</i> Gill, 1863	R	SP, TEP	2, CPUM, CNPE-IBUNAM	C
FAMILY SPARIDAE				
<i>Calamus brachysomus</i> (Lockington, 1880)	R	SP, TEP	1, 2, CPUM	C
FAMILY SCIAENIDAE				
<i>Bairdiella armata</i> Gill, 1863		TEP	1, 2	
<i>Bairdiella ensifera</i> (Jordan & Gilbert, 1882)		MP, PP	1, 2	
<i>Bairdiella icistia</i> (Jordan & Gilbert, 1882)		CP, MP	2	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>*Corvula macrops</i> (Steindachner, 1876)	R	TEP	CPUM	
<i>Cynoscion nannus</i> Castro-Aguirre & Arvizu-Martínez, 1976	PD	CP, MP	1, CPUM	C
<i>Cynoscion phoxocephalus</i> Jordan & Gilbert, 1882		MP, PP	1, 9, CPUM, CIBNOR	C
<i>Cynoscion reticulatus</i> (Günther, 1864)		TEP	1, 2	
<i>*Cynoscion stolzmanni</i> (Steindachner, 1879)		TEP	ICMYL	
<i>Elattarchus archidium</i> (Jordan & Gilbert, 1882)	PD	TEP	2, CPUM	C
<i>Isopisthus remifer</i> Jordan & Gilbert, 1882		TEP	2	
<i>Larimus acclivis</i> Jordan & Bristol, 1898	PD	TEP	2, CPUM	C
<i>Larimus argenteus</i> (Gill, 1863)	PD	TEP	1, 2, CPUM, ICMYL	C
<i>Larimus effulgens</i> Gilbert, 1898	PD	TEP	1, 2, 9, CPUM	C
<i>Menticirrhus elongatus</i> (Günther, 1864)	E	SR, TEP	2, CPUM	C
<i>Menticirrhus nasus</i> (Günther, 1868)		TEP	2, CPUM, CNPE-IBUNAM	C
<i>Menticirrhus panamensis</i> (Steindachner, 1875)		TEP	1, 2	
<i>Menticirrhus undulatus</i> (Girard, 1854)	PD	SR, TEP	1, CPUM	C
<i>Micropogonias altipinnis</i> (Günther, 1864)		TEP	2	
<i>*Micropogonias ectenes</i> (Jordan & Gilbert, 1882)	PD	SR, TEP	CPUM	C
<i>Micropogonias megalops</i> (Jordan & Gilbert, 1884)		CP, MP	1	
<i>Odontoscion xanthops</i> Gilbert, 1898	R	TEP	2, CPUM	
<i>Ophioscion imiceps</i> (Jordan & Gilbert, 1882)		MP, PP	2, ICMYL, CNPE-IBUNAM	
<i>Ophioscion scierus</i> (Jordan & Gilbert, 1884)		MP, PP	2, ICMYL	
<i>*Ophioscion strabo</i> Gilbert, 1897		TEP	ICMYL	
<i>*Ophioscion typicus</i> Gill, 1863		TEP	CNPE-IBUNAM	
<i>*Ophioscion vermicularis</i> (Günther, 1867)	PD	MP, PP	CPUM	C
<i>*Pareques fuscovittatus</i> (Kendall & Radcliffe, 1912)	R	MP	6, CPUM	
<i>Umbrina bussingi</i> López S., 1980	PD	MP, PP	1, 9, CPUM, ICMYL	C
<i>Umbrina dorsalis</i> Gill, 1862	R, E	TEP	2, 12, CPUM	
<i>Umbrina xanti</i> Gill, 1862	R, E	SR, TEP	1, 2, CPUM	C
FAMILY POLYNEMIDAE				
<i>Polydactylus approximans</i> (Lay & Bennett, 1839)	E	TEP	1, 2, 9, CPUM, SIO, CNPE-IBUNAM	C
<i>Polydactylus opercularis</i> (Gill, 1863)	E	SR, TEP	1, 2, 8, CPUM	C
FAMILY MULLIDAE				
<i>Mulloidichthys dentatus</i> (Gill, 1862)	R	TEP	2, 6, CPUM, ICMYL	C
<i>Pseudupeneus grandisquamis</i> (Gill, 1863)	R	TEP	1, 2, 9, CPUM, CNPE-IBUNAM	C
FAMILY KYPHOSIDAE				
<i>Kyphosus analogus</i> (Gill, 1862)	R	TEP	2, 4, CPUM	C
<i>Kyphosus elegans</i> (Peters, 1869)	R	TEP	2, 4, 5, CPUM	C
<i>Kyphosus ocyurus</i> (Jordan & Gilbert, 1882)	R	CT	1, 2, CPUM, SIO, ICMYL	C

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
FAMILY CHAETODONTIDAE				
<i>Chaetodon humeralis</i> Günther, 1860	PM, R	TEP	1, 2, 4, 5, 6, 9, CPUM	
<i>Johnrandallia nigrirostris</i> (Gill, 1862)	PM, R	SP, TEP	2, 6, CPUM	I
FAMILY POMACANTHIDAE				
<i>Holacanthus passer</i> Valenciennes, 1846	R	TEP	2, 6, CPUM	
<i>Pomacanthus zonipectus</i> (Gill, 1862)	R	SP, TEP	1, 2, 6, 9, CPUM, ICMYL	
FAMILY CIRRHITIDAE				
<i>Cirrhitichthys oxycephalus</i> (Bleeker, 1855)	R	TEP	2, 6, CPUM	
<i>Cirrhitis rivulatus</i> Valenciennes, 1846	PM, R	TEP	2, 4, 5, 6, CPUM	
FAMILY MUGILIDAE				
<i>Agonostomus monticola</i> (Bancroft, 1882)	E	AA	1, 3, 10, 12, 13, CPUM, ICMYL	
* <i>Chaenomugil proboscideus</i> (Günther, 1861)	PM	TEP	CPUM, ICMYL	
<i>Mugil cephalus</i> Linneaus, 1758		CT	1, 2	
<i>Mugil curema</i> Valenciennes, 1836	PM, E	AA	2, 3, 4, 5, 7, 8, 10, 12, 13, CPUM	C
FAMILY POMACENTRIDAE				
* <i>Abudefduf declivifrons</i> (Gill, 1862)	PM, R	TEP	4, 5, CPUM	
<i>Abudefduf troschelii</i> (Gill, 1862)	PM, R	SP, TEP	2, 5, 6, CPUM	
<i>Chromis atrilobata</i> Gill, 1862	R	TEP	2, 6, CPUM	
<i>Microspathodon bairdii</i> (Gill, 1862)	PM, R	TEP	2, 5, CPUM	
<i>Microspathodon dorsalis</i> (Gill, 1862)	PM, R	SP, TEP	2, 4, 5, 6, CPUM	I
<i>Stegastes acapulcoensis</i> (Fowler, 1944)	PM, R	MP, PP	2, 5, 6, CPUM	
<i>Stegastes flavilatus</i> (Gill, 1862)	PM, R	MP, PP	2, 5, 6, CPUM, ICMYL	
<i>Stegastes rectifraenum</i> (Gill, 1862)	PM, R	SP, CR, MP	2, 5, CPUM, ICMYL	
FAMILY LABRIDAE				
<i>Bodianus diplotaenia</i> (Gill, 1862)	R	SP, TEP	2, 6, CPUM, ICMYL	
<i>Halichoeres chierchiae</i> di Caporiacco, 1947	R	TEP	2, 6, CPUM	
<i>Halichoeres dispilus</i> (Günther, 1864)	PM, R	TEP	2, 4, 5, 6, CPUM	
<i>Halichoeres nicholsi</i> (Jordan & Gilbert, 1882)	R	TEP	2, 6, CPUM	
<i>Halichoeres notospilus</i> (Günther, 1864)	PM, R	TEP	2, 6, CPUM	
* <i>Iniistius pavo</i> (Valenciennes, 1840)	R	AP	CPUM	
* <i>Novaculichthys taeniourus</i> (Lacepède, 1801)	R	AP	6	
* <i>Thalassoma grammaticum</i> Gilbert, 1890	R	TEP	6, CPUM	
<i>Thalassoma lucasanum</i> (Gill, 1862)	PM, R	TEP	2, 5, 6, CPUM	
FAMILY SCARIDAE				
* <i>Calotomus carolinus</i> (Valenciennes, 1840)	PD	CT	6, CPUM	
* <i>Nicholsina denticulata</i> (Evermann & Radcliffe, 1917)	R	SP, TEP	CPUM	
* <i>Scarus compressus</i> (Osborn & Nichols, 1916)	R	TEP	6, CPUM	
<i>Scarus perrico</i> Jordan & Gilbert, 1882	R	TEP	2, 6, CPUM	C
FAMILY URANOSCOPIDAE				
<i>Astroscopus zephyreus</i> Gilbert & Starks, 1897	PD	SP, TEP	2, CPUM	A

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
FAMILY TRIPTERYGIIDAE				
<i>Axoclinus storeyae</i> (Brock, 1940)	PM, R	CP, MP	2, CPUM	
<i>Enneanectes carminalis</i> Jordan & Gilbert, 1882		TEP	2	
* <i>Enneanectes glendae</i> Roseblatt, Miller & Hastings, 2013	R	CP, MP	CPUM	
* <i>Enneanectes macrops</i> Roseblatt, Miller & Hastings, 2013	R	MP	CPUM	
FAMILY LABRISOMIDAE				
<i>Brockius striatus</i> (Hubbs, 1953)	PM, R	CP, MP	2, CPUM	
* <i>Labrisomus multiporosus</i> Hubbs, 1953	PM, R	TEP	CPUM	
* <i>Labrisomus xanti</i> Gill, 1860		SP, TEP	ICMYL	
<i>Malacoctenus ebisui</i> Springer, 1959	R	TEP	2, CPUM	
<i>Malacoctenus hubbsi</i> Springer, 1959	R	TEP	2, 5, CPUM	
* <i>Malacoctenus mexicanus</i> Springer, 1959	R	TEP	CPUM	
* <i>Malacoctenus tetranemus</i> (Cope, 1877)	PM, R	TEP	CPUM	
* <i>Malacoctenus zonifer</i> (Jordan & Gilbert, 1882)	PM	TEP	CPUM	
* <i>Paraclinus mexicanus</i> (Gilbert, 1904)	PM	TEP	CPUM	
* <i>Starksia posthon</i> Rosenblatt & Taylor, 1971	R	MP, PP	CPUM	
* <i>Starksia spinipenis</i> (Al-Uthman, 1960)	R	CP, MP	CPUM	
FAMILY CHAENOPSIDAE				
<i>Acanthemblemaria balanorum</i> Brock, 1940		TEP	2	
* <i>Acanthemblemaria macrospilus</i> Brock, 1940	R	CP, MP	CPUM	
* <i>Coralliozetus boehlkei</i> Stephens, 1963	R	TEP	CPUM	
* <i>Ekemblemaria myersi</i> Stephens, 1963	R	TEP	CPUM	
* <i>Protemblemaria bicirrus</i> (Hildebrand, 1946)	R	TEP	CPUM	
FAMILY DACTYLOSCOPIDAE				
<i>Dactyloscopus amnis</i> Miller & Briggs, 1962	E	MP, PP	1, 12, CPUM	
FAMILY BLENNIIDAE				
* <i>Entomacrodus chiocticus</i> (Jordan & Gilbert, 1882)	PM	TEP	CPUM	
* <i>Hypsoblennius brevipinnis</i> (Günther, 1861)	R	TEP	CPUM, SIO, ICMYL	
<i>Ophioblennius steindachneri</i> Jordan & Evermann, 1898	PM, R	TEP	2, 5, 6, CPUM, ICMYL	
<i>Plagiotremus azaleus</i> (Jordan & Bollman, 1890)	R	TEP	2, 6, CPUM	
FAMILY ELEOTRIDAE				
<i>Dormitator latifrons</i> (Richardson, 1844)	E	SP, TEP	1, 7, 8, 10, 12, 13, CPUM, CNPE-IBUNAM	
<i>Eleotris picta</i> Kner, 1863	E	TEP	1, 7, 8, 10, 12, 13, CPUM, CNPE-IBUNAM	
<i>Gobiomorus maculatus</i> (Günther, 1859)	E	TEP	1, 2, 7, 8, 10, 12, 13, CPUM, CNPE-IBUNAM	
* <i>Gobiomorus polylepis</i> Ginsburg, 1953	E	Brackish	CPUM	
FAMILY GOBIIDAE				
<i>Awaous banana</i> (Valenciennes, 1837)	E	SP, TEP	3, 8, 12, CPUM	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Barbulifer mexicanus</i> Hoese & Larson, 1985		CP, MP	1	
* <i>Bathygobius andrei</i> (Sauvage, 1880)	E	MP, PP	CPUM	
<i>Bathygobius ramosus</i> Ginsburg, 1947	PM	SP, TEP	1, 2, 5, CPUM, ICMYL	
* <i>Bollmannia marginalis</i> Ginsburg, 1939		TEP	9	
* <i>Bollmannia stigmatura</i> Gilbert, 1892		TEP	ICMYL	
* <i>Coryphopterus urospilus</i> Ginsburg, 1938	R	TEP	CPUM	
<i>Ctenogobius sagittula</i> (Günther, 1861)	E	TEP	12, CPUM	
* <i>Elacatinus puncticulatus</i> (Ginsburg, 1938)	R	TEP	CPUM	
<i>Gobionellus microdon</i> (Gilbert, 1892)	E	TEP	1, 3, 7, 10, 12, 13, CPUM	
* <i>Gymneleotris seminuda</i> (Günther, 1864)	R	TEP	CPUM	
<i>Microgobius miraflorensis</i> Gilbert & Starks, 1904		TEP	1	
* <i>Sicydium multipunctatum</i> Regan, 1905	E	Freshwater	CPUM	
FAMILY MICRODESMIDAE				
<i>Clarkichthys bilineatus</i> (Clark, 1936)	PM	TEP	CPUM	
<i>Microdesmus dorsipunctatus</i> Dawson, 1968	E	TEP	12, CPUM	
FAMILY EPHIPPIDAE				
<i>Chaetodipterus zonatus</i> (Girard, 1858)	R	SP, TEP	1, 3, 8, 9, CPUM	C
<i>Parapsetus panamensis</i> Steindachner, 1876		TEP	1, 3	
FAMILY ZANCLIDAE				
* <i>Zanclus cornutus</i> (Linnaeus, 1758)	R	SP, TEP	6, CPUM	
FAMILY ACANTHURIDAE				
<i>Acanthurus triostegus</i> (Linnaeus, 1758)	PM, R	AP	2, 5, 6, CPUM	
<i>Acanthurus xanthopterus</i> Valenciennes, 1835	R	AP	2, 6, CPUM	A
<i>Prionurus punctatus</i> Gill, 1862	PM, R	TEP	2, 5, 6, CPUM	A
FAMILY SPHYRAENIDAE				
<i>Sphyaena ensis</i> Jordan & Gilbert, 1882	R	TEP	1, 2, CPUM	C
FAMILY TRICHIURIDAE				
* <i>Trichiurus nitens</i> Garman, 1899	PD	CT	CPUM	I
FAMILY SCOMBRIDAE				
<i>Auxis brachydorax</i> Collette & Aadland 1996		SP, TEP	2	
<i>Euthynnus lineatus</i> Kishinouye, 1920	PD	SP, TEP	1, 2, CPUM, SIO	C
<i>Katsuwonus pelamis</i> (Linnaeus, 1758)		CT	2	
* <i>Sarda orientalis</i> (Temminck & Schlegel, 1844)	PD	AP	CPUM	C
<i>Scomberomorus sierra</i> Jordan & Starks, 1895	PD	SP, TEP	1, 2, CPUM	C
* <i>Scomber japonicus</i> Houttuyn, 1782	PD	CT	CPUM	C
<i>Thunnus alalunga</i> (Bonnaterre, 1788)		CT	1	
FAMILY ISTIOPHORIDAE				
<i>Istiophorus platypterus</i> (Shaw, 1792)		AP	2	
FAMILY STROMATEIDAE				
<i>Pepnilus medius</i> (Peters, 1869)	PD	TEP	2, CPUM	C
* <i>Pepnilus snyderi</i> Gilbert & Starks, 1904	PD	SP, TEP	CPUM	C
ORDER PLEURONECTIFORMES				
FAMILY PARALICHTHYIDAE				
<i>Ancylopsetta dendritica</i> Gilbert, 1890	PD	TEP	1, 2, 9, CPUM	C
<i>Citharichthys gilberti</i> Jenkins & Evermann, 1889	E	SP, TEP	1, 8, 12, CPUM	
* <i>Citharichthys platophrys</i> Gilbert, 1891		TEP	SIO	

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
<i>Cyclopsetta panamensis</i> (Steindachner, 1876)		TEP	1	
<i>Cyclopsetta querna</i> (Jordan & Bollman, 1890)	PD	TEP	1, 2, 9, CPUM, SIO	C
<i>Etropus crossotus</i> Jordan & Gilbert, 1882	PD	SR, TEP	1, 2, 9, CPUM, SIO	C
* <i>Etropus ectenes</i> Jordan, 1889	PD	SR, TEP	CPUM, SIO	
<i>Etropus peruvianus</i> Hildebrand, 1946		TEP	1	
<i>Hippoglossina tetrophthalmalma</i> (Gilbert, 1890)		TEP	2	
<i>Paralichthys woolmani</i> Jordan & Williams, 1897	D	TEP	1, 2, 9, CPUM, ICMYL	C
<i>Syacium latifrons</i> (Jordan & Gilbert, 1882)	PD	SR, TEP	1, 9, CPUM	C
* <i>Syacium longidorsale</i> Murakami & Amaoka, 1992		PP	CIBNOR	
<i>Syacium ovale</i> (Günther, 1864)	PD	TEP	1, 2, 9, CPUM, ICMYL	C
FAMILY BOTHIDAE				
<i>Bothus constellatus</i> (Jordan, 1889)	PD	TEP	1, 2, 9, CPUM	A
* <i>Bothus leopardinus</i> (Günther, 1862)		TEP	9	
<i>Engyophrys sanctilarentii</i> Jordan & Bollman, 1890		TEP	1, SIO	
FAMILY ACHIRIDAE				
<i>Achirus klunzingeri</i> (Steindachner, 1879)	E	MP, PP	12, CPUM	
<i>Achirus mazatlanus</i> (Steindachner, 1869)	E	TEP	1, 7, 12, CPUM	
<i>Achirus scutum</i> (Günther, 1862)	E	TEP	1, CPUM	
<i>Trinectes fonsecensis</i> (Günther, 1862)	E	TEP	1, 9, 10, 12, 13, CPUM	I
FAMILY CYNOGLOSSIDAE				
<i>Symphurus atricaudus</i> (Jordan & Gilbert, 1880)		CP, MP	1	
* <i>Symphurus callopterus</i> Munroe & Mahadeva, 1989		TEP	CAS	
<i>Symphurus elongatus</i> (Günther, 1868)	PD	SR, TEP	1, CPUM	I
* <i>Symphurus leei</i> Jordan & Bollman, 1890		MP, PP	9, SIO, ICMYL	
ORDER TETRADONTIFORMES				
FAMILY BALISTIDAE				
<i>Balistes polylepis</i> Steindachner, 1876	R	SR, TEP	1, 2, 4, 6, 9, CPUM	
* <i>Canthidermis maculata</i> (Bloch, 1786)	R	CT	CPUM	
<i>Pseudobalistes naufragium</i> (Jordan & Starks, 1895)	R	SR, TEP	2, 8, CPUM	
<i>Sufflamen fraenatum</i> (Latreille, 1804)	PD	AP	11, CPUM	
<i>Sufflamen verres</i> (Gilbert & Starks, 1904)	R	SR, TEP	2, 4, 6, CPUM	C
FAMILY MONACANTHIDAE				
* <i>Aluterus monoceros</i> (Linnaeus, 1758)	R	CT	9, CPUM	C
<i>Aluterus scriptus</i> (Osbeck, 1765)	R	CT	1, 6, CPUM-photo	
FAMILY OSTRACIIDAE				
<i>Ostracion meleagris</i> Shaw, 1796	R	AP	2, 6, CPUM	
FAMILY TETRAODONTIDAE				
* <i>Arothron hispidus</i> (Linnaeus, 1758)	R	CT	CPUM, ICMYL	
<i>Arothron meleagris</i> (Lacépède, 1798)	R	CT	2, 6, CPUM	I

	Collected habitat (2010–2011)	Ichthyogeographic affinity	References and organisms voucher	The importance in fisheries
** <i>Canthigaster janthinoptera</i> (Bleeker, 1855)	R	AP	CPUM	
<i>Canthigaster punctatissima</i> (Günther, 1870)	R	TEP	2, 6, CPUM	
* <i>Lagocephalus lagocephalus</i> (Linnaeus, 1758)		CT	9	
* <i>Sphoeroides sechuræ</i> Hildebrand, 1946	R	TEP	9, CPUM	A
<i>Sphoeroides annulatus</i> (Jenyns, 1842)	R, E	SP, TEP	1, 2, 4, 6, 8, 12, CPUM, SIO	
<i>Sphoeroides lobatus</i> (Steindachner, 1870)	R	TEP	2, 6, CPUM	I
FAMILY DIODONTIDAE				
<i>Diodon holocanthus</i> Linnaeus, 1758	R	CT	2, 6, 8, 9, CPUM	
<i>Diodon hystrix</i> Linnaeus, 1758	R	CT	1, 2, 4, 6, 9, CPUM	I

* New record for the state of Michoacan. **New record for the Mexico. Collection habitat: Reef (R), rocky intertidal or tidal pool (PM), estuary (E), demersal (D) pelagic-demersal (PD). Zoogeographical affinity: Circumtropical (CT), Amphiamerican (AA), Transpacific (AP) San Diegan province (SP), Cortés province (CP), Mexican province (MP), Panamic province (PP). Record from literature: Castro-Aguirre et al. 2006 (1), Madrid-Vera et al. 1998 (2), Medina-Nava et al. 2005 (3), Galván-Torres, 1989 (4), Aguirre-Villaseñor, 1991 (5), Domínguez-Domínguez, 1998 (6), González-Luna, 2000 (7), Madrigal-Guridi, 2006 (8), Sánchez-Aguilar, 2007 (9), Sandoval-Huerta et al. 2012 (10), Palacios-Morales et al. 2014 (11), Sandoval-Huerta et al. 2014 (12), Sandoval-Huerta et al. 2015 (13). Records from Fish Collection of Universidad Michoacana de San Nicolás de Hidalgo (CPUM), Fish Collection of the Institute of Biology of the National Autonomous University of Mexico (CNPE-IBUNA), fish collection of Instituto de Ciencias del Mar y Limnología (ICMYL), fish collection of California Academy of Sciences, San Francisco California, E.U.A. (CAS), the Marine Vertebrate Collection of Scripps Institution of Oceanography, San Diego, California (SIO) and fish collection of Biological Research Center Northwest S.C. (CIBNOR). Fishery importance: personal consumption (A), commercial use (C) and discarded (I).

Pristis pristis (Linnaeus, 1758), *Aetobatus laticeps* (Euphrasen, 1790), *Apogon pacificus* (Herre, 1935), *Coryphaena hippurus* Linnaeus, 1758, *Kyphosus ocyurus* (Jordan & Gilbert, 1882), and *Novaculichthys taeniourus* (Lacepède, 1801). Of the 436 species, 131 were new records for the Michoacán State, and *Canthigaster janthinoptera* (Bleeker, 1855) was a new record for Mexico (Table 1).

For the specimens collected during field trips, some were collected from a single habitat type: 123 (40%) were collected in reefs, 57 (19%) in the pelagic-demersal zone, 46 (15%) in estuarine zones, 17 (6%) in the demersal zones, and 14 (5%) in rocky intertidal zones. Forty-seven species were collected in more than one habitat type (Table 1 and Fig. 2).

The artisanal fishery captures yielded 154 species. The families with the highest number of species were Carangidae (17), Haemulidae (15), Sciaenidae (13), Serranidae (10), and Lutjanidae (7). Of these, 104 (68%) were commercially valuable, 23 (15%) were used for direct consumption or as bait. Twenty-seven (18%) were bycatch, that are normally rejected and thrown back (Fig. 3).

Forty-six (11%) of the species were circumtropical, 27 (6%) transpacific, and seven (2%) amphi-American; whereas 350 (81%) belonged to the TEP. Of these 77

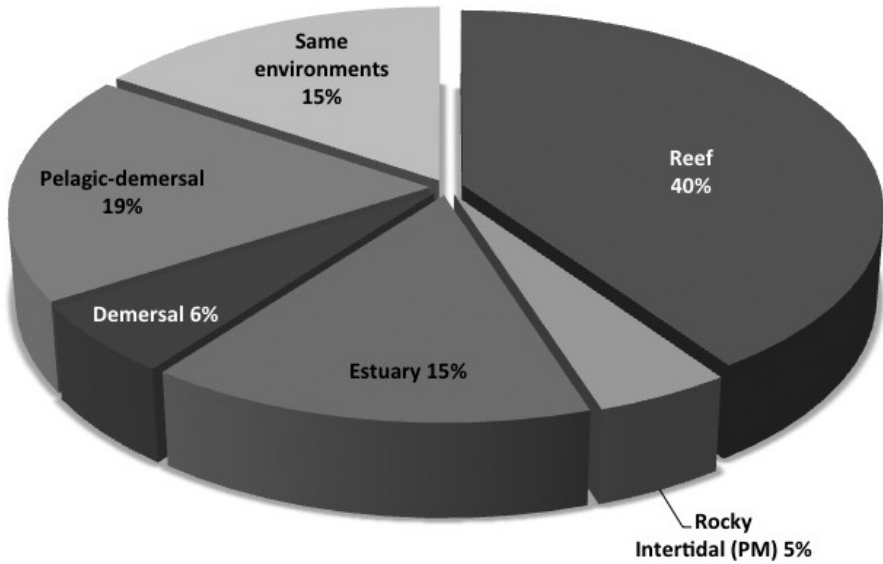


Figure 2. Percent of species collected in each habitat.

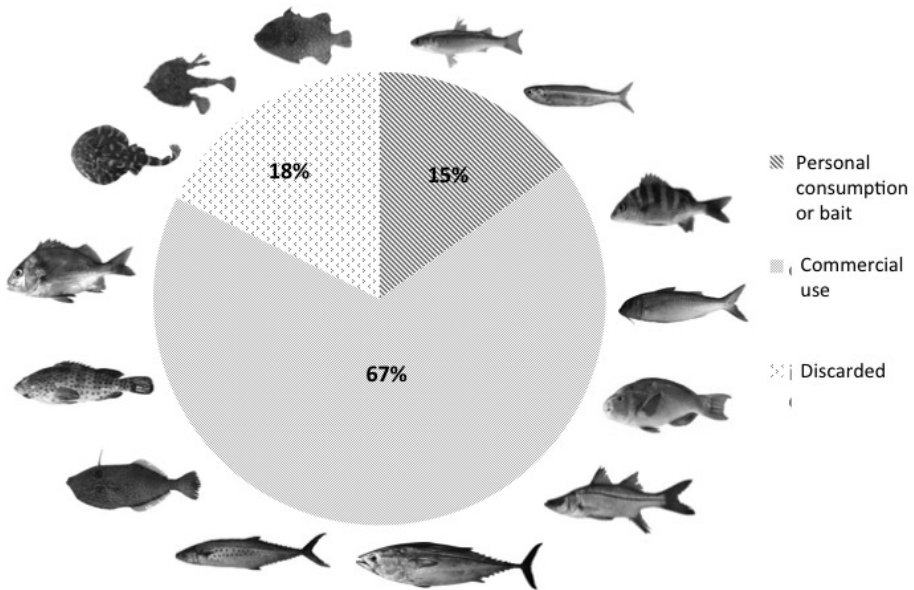


Figure 3. Classification of commercial importance of the species captured in the Michoacán coastal fisheries.

(18%) were widely distributed from the San Diegan province to the Panamic province, and 3 (1%) from the San Diegan province to the Mexican province. The largest number of species, 216 (49.2%), were found in the three provinces of the TEP; 15

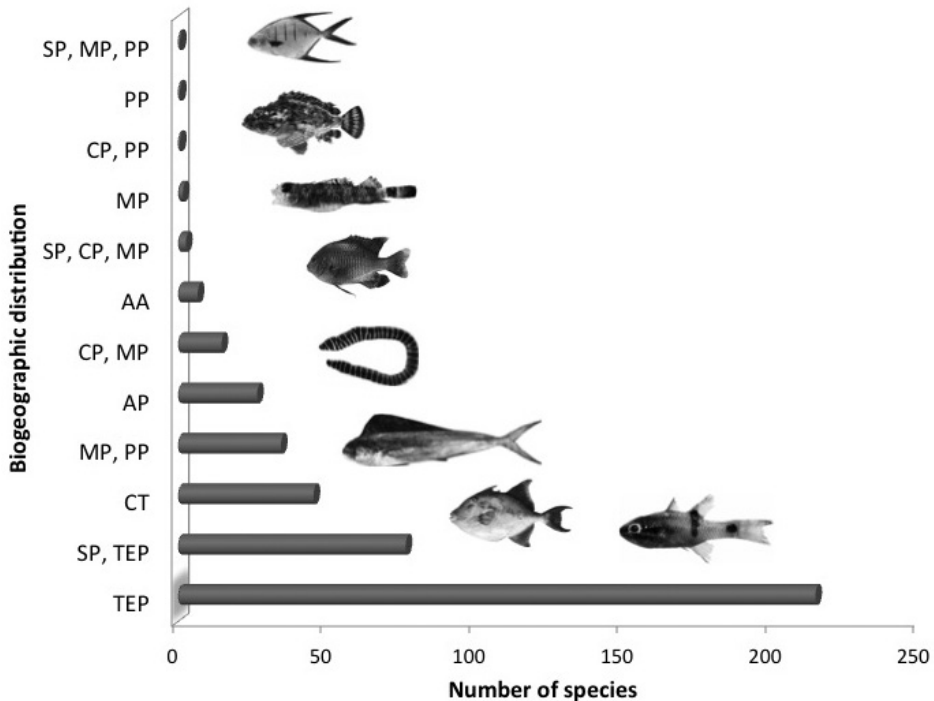


Figure 4. Biogeographic affinity of the fish fauna recorded on the Michoacán Coast. TEP, Tropical Eastern Pacific; CT, Circumtropical; AP, Transpacific species; AA, Amphi-American species; SP, San Diegan province; CP, Cortez province; MP, Mexican province; PP, Panamic province.

(3%) were restricted to the Cortez and the Mexican provinces; 35 (8%) were limited to the Mexican and Panamic provinces; and 2 (0.5%) were endemic to the Mexican province (Fig. 4). Six species collected in the estuarine ecosystems occurred in fresh or brackish water habitats and were not included in the marine biogeographical affinity categories: *Gobiomorus polylepis* Ginsburg, 1953 (brackish), *Sicydium multipunctatum* Regan, 1905, *Gobiesox mexicanus* Briggs & Miller, 1960, and *Poecilia butleri* Jordan, 1889 (fresh water). The introduced species *Pterygoplichthys disjunctivus* (Weber, 1991) and *Cyprinus carpio* Linnaeus, 1758 were also omitted.

Discussion

The present checklist represents the most updated and comprehensive systematic list of fishes recorded from the coast of the Mexican State of Michoacán. Of the species cataloged, 30% were first records for this State. The highest proportion of cataloged species was collected in reefs (40%). The pelagic zone accounted for 24% of the species collected, indicated a requirement for future studies of the demersal and pelagic

zones with increased sampling effort (Fig. 2). The highest number of new records for Michoacán was found in reefs, chiefly species exhibiting cryptic behavior (Table 1). This could be related to the sampling methods employed, which had not been previously used; the few previously reported species with cryptic behavior were primarily bycatch (Madrid-Vera 1998, Castro-Aguirre et al. 2006, Moncayo-Estrada et al. 2006, Chávez-Comparan 2008, Márquez-Espinoza 2012). Another source of new species records from Michoacán was the intertidal zone (Table 1), for which no published records are available. In general, the number of species in the area may be increased if sampling effort is expanded and records from shrimp and tuna bycatches are included. A new record was obtained for Mexico, two specimens of *C. janthinoptera* (Bleeker, 1855) were collected from Barco Hundido del Faro de Bucerias (CPUM 4532, N 18°21'8.82"W -103°31'18.71"), which identification was corroborated by BLAST (<http://www.ncbi.nlm.nih.gov/genbank>) and by boldsystems (<http://www.boldsystems.org>), searches showing 99% similarity in the cytochrome oxidase subunit 1 gene (COX-1) to specimens identified as *C. janthinoptera* from the south Tropical Eastern Pacific and the Indo-Pacific Ocean (GenBank accession numbers: KX505745 and KX505746). One specimen of *Bathygobius andrei* (Sauvage, 1880) (Gobiidae) was also reported in the Chuta estuary (CPUM 3296, 18°2'1"N and 102°33'33"W), representing an extension of its previously known northern distribution limit of the coast of Chiapas (Gómez-González et al. 2012). One specimen of *Calotomus carolinus* (Valenciennes, 1840) was collected from rocky reef in Faro de Bucerias location (18°20'50"N and 103°30'37"W), extending its extension range in the TEP.

In artisanal fishing (Fig. 3), the species considered to have the highest economic value belong chiefly to Carangidae (e.g. *Alectis ciliaris*, (Bloch, 1787)), Lutjanidae (e.g. *Lutjanus guttatus*, (Steindachner, 1869)), Paralichthyidae (e.g. *Cyclosetta querna*, (Jordan & Bollman, 1890)), Centropomidae (e.g. *Centropomus armatus*, Gill, 1863), and Serranidae (e.g. *Epinephelus labriformis*, (Jenyns, 1840)) (Table 1). Most of the elasmobranch capture, with the exception of the fins, is considered of low economic value. A high number of neonatal and juvenile hammerhead sharks (*Sphyrna* sp.), were captured, as well as pregnant *Rhinobatos glaucostigma* Jordan & Gilbert, 1883, *Gymnura marmorata* (Cooper, 1863), and *Urotrygon* spp. In general, the elasmobranchs, due to their unique biological and ecological characteristics, present low population growth and are considered highly vulnerable (Frisk et al. 2005, Hutchings et al. 2012). We accordingly recommend review and enforcement of the relevant legislation.

Bycatch in commercial fishing is frequently used for personal consumption, bait (-50%), or discarded (Fig. 3). Species with no current market value may have high nutrient value; hence the number of species with potential to be commercialized is underestimated. In offshore fisheries, these species often have commercial value. For instance, *Scorpaena mystes* (Jordan & Starks, 1895) reaches 35.6 cm and is marketed in regions such as Baja California. *Trichiurus nitens* Garman, 1899 supports a small fishery in the central portion of the littoral zone of Ecuador (pers. obs. Romero-Gallardo), whereas, in Michoacán, this species is not used for human consumption.

It was observed that 49% of the listed species are reported as also occurring throughout the three TEP provinces, with 8% of the species reported only in the Panamic and Mexican provinces, being mostly of tropical affinity, agreeing with previous fish fauna surveys in the area (Castro-Aguirre et al. 2006, Moncayo-Estrada 2006). The presence of 81 species (19%) with affinity to the San Diegan province (Fig. 4), a temperate-warm zone, reflects the dynamics of the current flow system of the Michoacán coast, reaffirming this region as a transition zone.

Although visual censuses and photo identification of fish species is widely used for the study of richness, diversity, and ecology of marine habitats (Aguilar-Palomino 2002, Palacios-Salgado 2005, Galván-Villa 2016), it is necessary to rely on reference organisms for taxonomic corroboration. A high proportion of small, nocturnal, or ecologically cryptic species may not be counted in a visual census, especially when the fish fauna of the area under study is not well known, as is the case for the Michoacán State.

The collections obtained in the present study enriched the records of the CPUM collection by 19%, since the majority of marine species previously collected remain in collections outside of Michoacán. Many species reported in this study as new records (Table 1) were included by Robertson and Allen (2015), although these authors listed them in the littoral zone of Michoacán coastline only as potential distribution based on habitat suitability. We have confirmed the distribution of such fish, as exemplified by the first formal record of 24 ecologically cryptic species. Our work expanded on the most complete fish fauna checklist previously available for the area by 32.5% (Madrid et al. 1998) and will undoubtedly represent important input for decisions about conservation and management of the coastal area of Michoacán State.

Acknowledgements

We would like to thank to CONABIO for the financial support of the HJ021 Project: Listado taxonómico de la ictiofauna de la costa de Michoacán; to the Coordination of Scientific Research (CIC 2010-UMSNH) for grant support. ODD also thanks CONACYT for partial support under project CB-240875 and for a sabbatical grant. Our special thanks and appreciation must go to the inhabitants, fishermen, and cooperatives of Michoacán who gave us their full support for the completion of this study. We are grateful to Sesángari Galvan, Adrián F. González-Acosta, Felipe Galván Magaña and Leonardo Andrés Abitia Cárdenas (CICIMAR-IPN), Arturo Ramírez-Valdez (UABC), Eduardo F. Balart (CIBNOR), Gorgonio Ruíz Campos (UABC) and Philip A. Hastings (SIO), for their assistance in the identification of the collected organisms and for information provided. We thank Ross Robertson, Arturo Angulo, an anonymous reviewer for the useful comments which improved the manuscript. Thanks are also due to all the members of the HJ021 project, without whose support in field surveys this work might not have been completed. We also thanks to Kathleen Hills and Alan Pike for reviewing the English.

References

- Aguilar-Palomino C, Pérez R, Galván-Magaña F, Abitia-Cárdenas A (2001) Ictiofauna de la Bahía de Navidad, Jalisco, México. *Revista de Biología Tropical* 49: 173–190.
- Allen GR, Robertson DR (1991) Descriptions of two new genera and four new species of Triplefins (Pisces: Tripterygiidae) from the tropical eastern Pacific. *Revue française Aquariologie* 18: 79–82.
- Allen GR, Robertson DR (1992) Three new species of Triplefins (Pisces: Tripterygiidae) from Malpelo and Socorro Islands, in the tropical eastern Pacific. *Revue française Aquariologie* 19: 53–56.
- Allen GR, Robertson DR (1998) *Peces del Pacífico Oriental Tropical*. CONABIO-Agrupación Sierra Madre, México, 328 pp.
- Amezcuca-Linares F (2009) *Peces Demersales del Pacífico Mexicano*. UNAM-ICMyL, México, 281 pp.
- Benitez CO (2004) Contribución al estudio de la filogenia molecular de los peces de la familia Gerreidae en México. Master Thesis, Instituto Politécnico Nacional, La Paz, México.
- Bleeker P (1855) Zesde bijdrage tot de kennis der ichthyologische fauna van Amboina. *Natuurkundig Tijdschrift voor Nederlandsch Indië* 8: 391–434.
- Briggs JC (1955) A monograph of the clingfishes (Order Xenopterygii). *Stanford Ichthyological Bulletin* 6: 1–224.
- Briggs JC, Miller RR (1960) Two new freshwater fishes of the genus *Gobiesox* from southern México. *Occasional Papers of the Museum of Zoology, University of Michigan* 616: 1–15.
- Briggs JC (1974) *Marine zoogeography*. McGraw-Hill, New York, 473 pp.
- Briggs JC (1995) *Global biogeography*. *Developments in Palaeontology and Stratigraphy* 14. Elsevier, Amsterdam, 452 pp.
- Carpenter KE, Niem V (2001) *FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals*. Rome 4(6): 3381–4218.
- Castro-Aguirre JL, Espinoza-Pérez HS, Schmitter-Soto JJ (1999) Ictiofauna estuarino-lagunar y vicaria de México. *Colección de textos politécnicos. Serie biotecnologías*. Ed. Limusa. Primera edición. México, 711 pp.
- Castro-Aguirre JL, González-Acosta AF, Agüero JC, Moncayo-Estrada R (2006) Ictiofauna marina-costera del Pacífico central mexicano: análisis preliminar de su riqueza y relaciones biogeográficas. In: Jiménez-Quiroz MC, Espino-Barr E (Eds) *Los recursos pesqueros y acuícolas de Jalisco, Colima y Michoacán*. INP, SAGARPA, México, 149–165.
- Chávez-Comparan JC, Galeana LGG, Manzo VI, Salinas SJA (2008) *Catálogo de peces de arrecifes rocosos-coralinos de Punta Carrizales, Colima, México*. Facultad de ciencias Marinas. Universidad de Colima, México, 118 pp.
- Correa PG, Gómez RM (2003) *Litoral. Atlas Geográfico del Estado de Michoacán*. EDDISA, en Colaboración SEEM, UMSNH y Colegio de Michoacán, México.
- CONAPESCA (2014) *Base de datos de producción, anuario estadístico de Acuicultura y Pesca*. Comisión Nacional de Acuicultura y Pesca, México. http://www.conapesca.sagarpa.gob.mx/wb/cona/anuario_2014_zip

- Del Moral-Flores LF, González-Acosta AF, Espinosa-Pérez H, Riuz-Campos G, Castro-Aguirre JL (2013) Lista anotada de la ictiofauna de las islas del golfo de California, con comentarios sobre sus afinidades zoogeográficas. *Revista Mexicana de Biodiversidad* 84: 184–214. doi: 10.7550/rmb.27335
- Eschmeyer WN, Fricke R, van der Laan R (2016) *Catalog of Fishes: Genera, Species, References*. <http://research.calacademy.org/ichthyology/catalog/fishcatmain.asp> [accessed 20 March 2016]
- Fisher W, Krupp F, Schneider W, Sommer C, Carpenter KE, Niem VH (1995) *Vertebrados 1-2. Guía FAO para la identificación de especies para los fines de la pesca – Pacífico Centro - Oriental*. FAO, Roma, 647–1813.
- Frisk MG, Miller TJ (2005) Life Histories and Vulnerability to Exploitation of Elasmobranchs: Inferences from Elasticity, Perturbation and Phylogenetic Analyses. *Journal of Northwest Atlantic Fisheries Science* 35: 27–45. doi: 10.2960/J.v35.m514
- Froese R, Pauly D (2013) *FishBase*. World Wide Web electronic publication <http://www.fishbase.org> [accessed February 2016]
- Galván-Villa CM, Ríos-Jara E, Bastida-Izaguirre D, Hastings PA, Balart EF (2016) Annotated checklist of marine fishes from the Sanctuary of Bahía Chamela, Mexico with occurrence and biogeographic data. *ZooKeys* 554: 139–157. doi: 10.3897/zookeys.554.6106
- Gómez-González AE, Velázquez-Velázquez E, Rodiles-Hernández R, González-Díaz AA, González-Acosta AF, Castro-Aguirre JL (2012) Lista sistemática de la ictiofauna de la Reserva de la Biosfera La Encrucijada, Chiapas, México. *Revista Mexicana de Biodiversidad* 83: 674–686. doi: 10.7550/rmb.24468
- Hastings PA (2000) Biogeography of the Tropical Eastern Pacific: distribution and phylogeny of Chaenopsid fishes. *Zoological Journal of the Linnean Society* 128: 319–335. doi: 10.1111/j.1096-3642.2000.tb00166.x
- Hastings PA, Robertson DR (1999) Notes on a collection of Chaenopsid blennies from Bahía Azul, Bocas del Toro, Caribbean Panama. *Revue française Aquariologie* 26: 33–38.
- Hastings PA, Robertson DR (1999b) *Acanthemblemaria atrata* and *Acanthemblemaria mangonatha*, new species of eastern Pacific barnacle blennies (Chaenopsidae) from Isla del Coco, Costa Rica and Islas Revillagigedo, México, and their relationships with other barnacle blennies. *Revue Française de Aquariologie* 25: 107–118.
- Himaya Y, Kumada T (1940) *Peces marinos de la Costa Mexicana del Pacífico*. Talls. De la Nac., México, 78.
- Hubbs CL (1953) Revision of the Eastern Pacific fishes of the Clinid genus *Labrisomus*. *Zoologica* 38: 113–136.
- Hutchings JA, Myers RA, García VB, Lucifora LO, Kuparinen A (2012) Life-history correlates of extinction risk and recovery potential. *Ecological Applications* 22: 1061–1067. doi: 10.1890/11-1313.1
- Jordan DS, Evermann BW (1900) *The fishes of north and Middle America*. *Bulletin United States National Museum* 47: 1–3313.
- Kessler WS (2006) The circulation of the eastern tropical Pacific: A review. *Progress in Oceanography* 69: 181–217. doi: 10.1016/j.pocean.2006.03.009
- Lara-Lara JR, Fuentes VA, Guzmán CB, Castañeda VD, Briones EE, Abad MCG, Castro GG (2008) Los ecosistemas marinos. In: Sarukhan J (Ed.) *Capital de México I. Conocimiento de la Biodiversidad*, CONABIO, México, 133–159.

- Latreille PA (1804) Tableaux Methodiques des Poissons. In: Nouveau Dictionnaire d'Histoire Naturelle (1st edn), Vol. 24. Paris, 71–105.
- Lavenberg RJ, Chernoff M (1995) Atherinidae. Pejerreyes. In: Fischer W, Krupp F, Schneider W, Sommer C, Carpenter KE, Niem V (Eds) Guía FAO para Identificación de especies para los fines de la Pesca. Vol. 2. Pacífico Centro-Oriental. FAO, Rome, 889–901.
- Lessios HA, Allen GR, Wellington GM, Bermingham E (1995) Genetic and morphological evidence that the Eastern Pacific damselfish *Abudefduf declivifrons* is distinct from *A. concolor* (Pomacentridae). *Copeia* 2: 277–288. doi: 10.2307/1446891
- López-Pérez RA, Pérez-Maldonado IL, López-Ortiz AM, Barranco-Servín LM, Barrientos-Villalobos J, Leyte-Morales GE (2010) Reef fishes of the Mazunte-Bahías de Huatulco reef track, Oaxaca, Mexican Pacific. *Zootaxa* 2422: 53–62.
- Madrid-Vera J, Ruiz-Luna A, Rosado-Bravo I (1998) Peces de la plataforma continental de Michoacán y sus relaciones regionales en el Pacífico Mexicano. *Revista de Biología Tropical* 46: 267–276.
- Madrigal-Guridi X (2006) Distribución espacial y temporal de la ictiofauna del estero de Santa Ana, Michoacán, México. Mather Thesis, Universidad Nacional Autónoma de México, México.
- Márquez-Espinoza A (2012) Listado sistemático de los peces marinos de la costa Norte del estado de Guerrero, México. In: Del Moral-Flores LF, Martínez-Pérez JA, Franco-López J, Ramírez-Villalobos AJ, Tello-Musi JL (Eds) Investigación Ictiológica en México: Temas selectos en honor al Dr. José Luis Castro Aguirre. Universidad Nacional Autónoma de México, Facultad de Estudios Superiores Iztacala y Sociedad Ictiológica Mexicana A.C. México, 159–167.
- Medina-Nava M, Osorio R, Domínguez-Domínguez O. (2001) La Biodiversidad en Michoacán: Los Peces. Gobierno del Estado de Michoacán y Universidad Michoacana de San Nicolás de Hidalgo. México, 95–99.
- Miller PJ, Stefanni S (2001) The Eastern Pacific species of *Bathygobius* (Perciformes: Gobiidae). *International Journal of Tropical* 49: 141–156.
- Miller RR, Minckley WL, Norris SM (2005) Freshwater fishes of Mexico. University of Chicago Press. Chicago, 652 pp.
- Moncayo-Estrada R, Castro-Aguirre J, De la Cruz-Agüero J (2006) Lista sistemática de la ictiofauna de Bahía Banderas, México. *Revista Mexicana de Biodiversidad* 77: 67–80.
- Nelson JS, Grande TC, Wilson MVH (2016) Fishes of the World (5th edition). John Wiley and Sons, Hoboken, New Jersey, 752 pp. doi: 10.1002/9781119174844
- Palacios-Salgado DS (2005) Asociaciones de peces en los arrecifes rocosos de la Bahía de Acapulco, Guerrero, México. Master thesis, Baja California Sur, Instituto Politécnico Nacional, México.
- Palacios-Morales G, Torres-Hernández E, Campos-Mendoza A, Domínguez-Domínguez O (2014) Corroboración taxonómica y genética de la presencia del ballesta enmascarado *Sufflamen fraenatum* (Balistidae) para la costa de México. *Revista Mexicana de Biodiversidad* 85: 641–644. doi: 10.7550/rmb.36883
- Pfeiler E (2008) Resurrection of the name *Albula pacifica* (Beebe, 1942) for the shafted bonefish (Albuliformes: Albulidae) from the eastern Pacific. *Revista de Biología Tropical* 56: 839–844.

- Robertson DR, Allen GR (2015) Peces Costeros del Pacífico Oriental Tropical: sistema de Información en línea. Versión 2.0 Instituto Smithsonian de Investigaciones Tropicales, Balboa, República de Panamá. <http://biogeodb.stri.si.edu/sfstep/es/pages> [last accessed in March 2016]
- Robertson DR, Cramer KL (2009) Marine shore fishes and biogeographic subdivisions of the tropical Eastern Pacific. *Marine Ecology Progress Series* 380: 1–16. doi: 10.3354/meps07925
- Rosenblatt RH, Parr TD (1969) The Pacific species of the clinid fish genus *Paraclinus*. *Copeia* 1969: 1–20. doi: 10.2307/1441691
- Rosenblatt RH, Taylor LR (1971) The Pacific species of the clinid fish tribe starksiini. *Pacific Science* 25: 436–463.
- Rosenblatt RH, Miller EC, Hastings PA (2013) Three new species of triplefin blennies of the genus *Enneanectes* (Teleostei, Tripterygiidae) from the tropical eastern Pacific with a key to Pacific species of *Enneanectes*. *Zootaxa* 3636: 361–373. doi: 10.11646/zootaxa.3636.2.7
- Sánchez-Aguilar D (2007) Ecología de la Ictiofauna demersal en la costa de Michoacán. Master Thesis, Universidad a de San Nicolás de Hidalgo, Michoacán.
- Sandoval-Huerta ER, Madrigal-Guridi X, García-Meraz A, Dimas-Mora NI, Domínguez-Domínguez O, González-Acosta AF (2012) First records of *Atherinella panamensis* in the Pacific Central Mexican coasts. *Cybium* 36: 587–588.
- Sandoval-Huerta ER, Madrigal-Guridi X, García-Meraz A, Dimas-Mora NI, Domínguez-Domínguez O (2012b) Nuevo registro de *Pterygoplichthys disjunctivus* (Actinopterygii: Loricariidae) en la desembocadura del río Coahuayana, Coahuayana, Michoacán, México *Revista Mexicana de Biodiversidad* 83: 294–297.
- Sandoval-Huerta ER, Madrigal-Guridi X, Escalera-Vázquez LH, Medina-Nava M, Domínguez-Domínguez O (2014) Estructura de la comunidad de peces en cuatro estuarios del Pacífico mexicano central. *Revista Mexicana de Biodiversidad* 85: 1184–1196. doi: 10.7550/rmb.42105
- Shaw G (1804) *Pisces. General Zoology or Systematic Natural History* (Vol. 5). London.
- Springer VG (1959) Systematics and Zoogeography of the Clinid Fishes of the Subtribe Labrisomini Hubbs. Department of Zoology and Institute of Marine Science. University of Texas 5: 417–492.
- Springer VG (1962) A Review of the Blennioid Fishes of the Genus *Ophioblennius* Gill. *Copeia* 2: 426–433. doi: 10.2307/1440912
- Thomson DA, Findley LT, Kerstitch AN (2000) Reef fishes of the Sea of Cortez. University of Texas Press, 353 pp.
- Viesca-Lobatón C (2005) Evaluación preliminar del proceso de rehabilitación del arrecife coralino de San Lorenzo en la Bahía de la Paz, B.C.S., México. Master thesis, Baja California Sur, México: Centro de Investigaciones Biológicas del Noroeste, S.C. CIBNOR.
- Zapata FA, Robertson DR (2007) How many species of shore fishes are there in the Tropical Eastern Pacific? *Journal of Biogeography* 34: 38–51. doi: 10.1111/j.1365-2699.2006.01586.x