

Marine fishes of Acapulco, Mexico (Eastern Pacific Ocean)

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Abstract A comprehensive systematic checklist of the marine ichthyofauna of Acapulco Bay and its adjacent coastal zone is presented. The information was obtained from field surveys using several methods, including: visual censuses, video-transects, subaquatic photography, and spearfishing captures; anesthesia of fish associated with reef ecosystems; gill-nets and beach seines; fish associated with oyster seed collectors; and fish caught by local fishermen. The checklist comprises 292 species from 192 genera, 82 families, 33 orders, and 2 classes. The families with the highest specific richness were the Carangidae, Haemulidae, and Sciaenidae, with 28, 20, and 19 species, respectively. At the genus level, there were records of seven *Lutjanus* species, six *Caranx* species, and five *Haemulon*, *Cynoscion* and *Halichoeres* species. A high percentage of the recorded species have a wide distribution, where 6.7 % are circumtropical, 31.2 % have a

distribution that includes the Cortez and Panamic provinces, and 19.3 % of the species have a wide distribution that encompasses from the San Diegan to the Panamic province. Four species are endemic to the Mexican province (*Pareques fuscovittatus*, *Malacoctenus polyporosus*, *Paraclinus stephensi* and *Stathmonotus lugubris*), while *Enneanectes reticulatus* and *Paraclinus monophthalmus* are endemic to the Cortez and Panamic provinces, respectively, and represent new records for the Mexican central Pacific. The ichthyofauna recorded during this study is characteristic of the biogeographic transitional subtropical–tropical zone of the Eastern Pacific. Most specimens were tropical, and there was an important component of species belonging to over five different affinities, which could be a result of the different habitat preferences and dominant types of reproduction. Some explanations for the fish composition of this important touristic bay are discussed, as well as the need to establish a knowledge baseline of the natural resources of this ecosystem in order to outline adequate management and conservation strategies.

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Introduction

Acapulco Bay (AB) is located within the Mexican Tropical Pacific (MTP); it is one of the primary tourist centers of Mexico (Ramírez Sáiz 1987), with a long history of marine resource use as well as natural and anthropogenic disturbances, which lead to important environmental impacts (Jonathan et al. 2011). AB is included within the Coyuca-Tres Palos marine priority region because of its high diversity, its use by different sectors, and its threatened biodiversity (Arriaga-Cabrera et al. 1998).

The fish communities of the MTP are well known by the studies done by Allen and Robertson (1998), Amezcua-

Linares (2009) and Robertson and Allen (2008), who created comprehensive catalogues of species distributed over the region, while Robertson and Cramer (2009) analyzed the biogeographic relationships among these species. However, there is little knowledge of the species that make up some of the most representative bays and littoral in the MTP region: studies have only been conducted for the Sinaloa coast (Jordan 1895; van der Heiden and Findley 1988), Colima (Chávez-Comparan and Macías-Zamora 2006), Michoacán coast (Madrid-Vera et al. 1998), and Oaxaca (López-Pérez et al. 2010, 2013). The few studies along the coast of Guerrero took place several decades ago, and were all directed to a specific component of the community, or were conducted using a single method (fish checklist of the Guerrero coast, Ramírez-Hernández and Páez 1965; lagoon system of Guerrero, Yáñez-Arancibia 1978; rocky reefs of AB, Palacios-Salgado 2005).

Baseline studies for the state of Guerrero are of high priority because water bodies such as AB and coastal lagoons in the region have begun to show signs of environmental decline due to strong anthropogenic impacts and to overexploitation of fishing resources (De la Lanza et al. 2008; Jonathan et al. 2011; Meave-del Castillo et al. 2012). The lack of a complete fish checklist hinders efforts of managers who require a comprehensive baseline dataset to adequately monitor possible temporal changes in community composition, caused by either anthropogenic or natural forces (Reyes-Bonilla et al. 2010). Furthermore, without a detailed inventory of fish species, any biogeographic analysis or management strategy of AB is limited in scope. The objective of this work is to provide the first comprehensive systematic checklist of the marine ichthyofauna of AB and its adjacent coastal zone, based on field surveys carried out using diverse methods and over a long time frame. We performed an overview of the fish community composition, a descriptive analysis of the feeding guilds, reproductive strategies, habitat affinity, and an analysis of zoogeographic affinity of the species.

Materials and methods

Acapulco Bay (AB) is a coastal ecosystem within the Tropical Eastern Pacific (TEP); it is located in the central region of the Mexican state of Guerrero, and is bordered to the northwest by Punta Bruja and to the southeast by Punta Grifo (16°48'54"–16°51'55"N, 99°51'03"–99°54'16"W; Fig. 1). AB is a semi-closed shallow bay, over 6.3 km wide in the interior, and is connected to the ocean at the southern end through a delta approximately 2.8 km wide. The northern end of the bay is limited by a peninsula, which is divided by the Boca Chica channel, forming the 0.71 km² La Roqueta Island. The southern end of the bay is limited by a cape which that forms a smaller second bay (Puerto Márquez) with an entrance to the west.

This region's distinctive morphology explains in part the complexity of its hydrodynamic system. The current that enters the bay from the west, between La Roqueta Island and the peninsula, reaches the southern end of the bay and moves in a cyclonic direction propelled by the dominant winds from the west, and finds exit flows in the center of the bay, and towards Punta Bruja, at the northern end of the bay (Secretaría de Marina 1977). Other important characteristics of this system are: its closeness to coastal lagoons (Coyuca lagoon is less than 25 km north of the mouth of the bay, and 30 km to the south is Laguna de Tres Palos), the flow of several streams into the bay (Meave-del Castillo et al. 2012), and the different substrate types found inside AB. The substrate is predominantly soft (sandy) with patches of coralline reefs, rocky reefs, islets, and seamounts inside the bay, which results in a highly heterogeneous system (Palacios-Salgado 2005). The depth inside the bay oscillates between 10 and 45 m, and SST ranges from 27.7 to 33.5 °C (Secretaría de Marina 1977; Fiedler and Talley 2006).

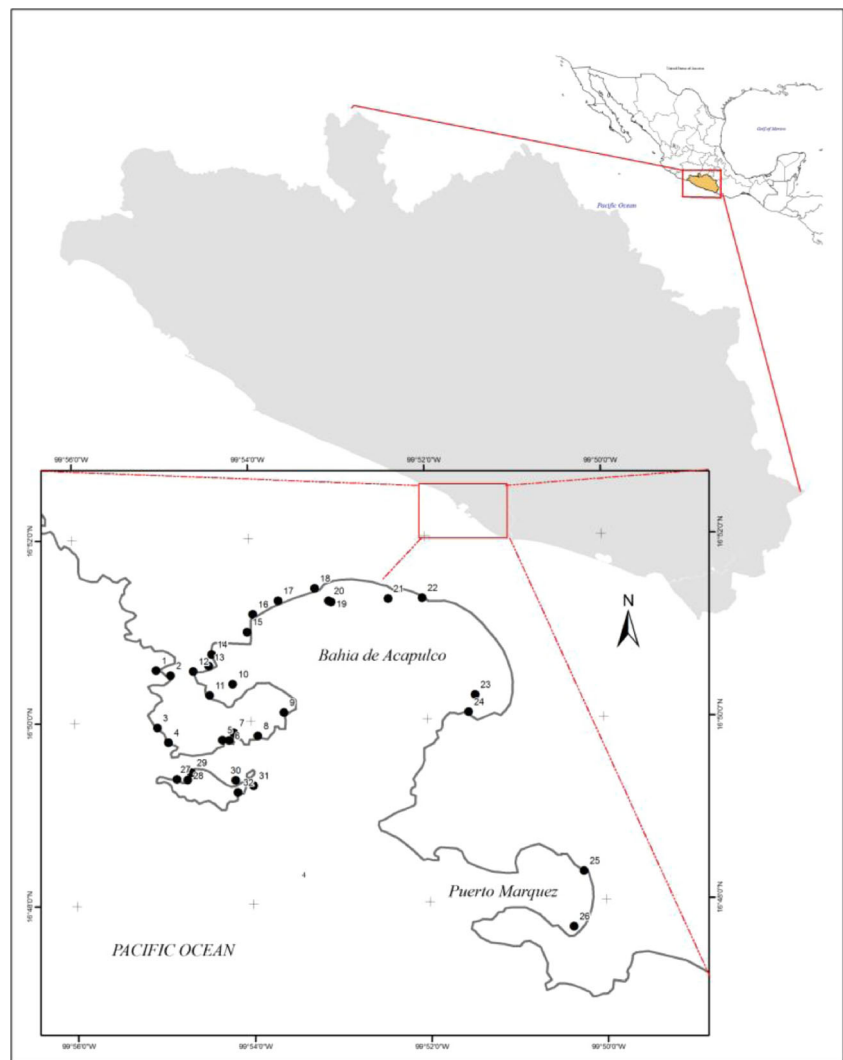
The coastal zone of the study area is influenced by the Eastern Pacific Warm Pool, which extends from Guatemala to the southwestern coast of Mexico, and is characterized by high temperatures with small annual oscillations (<2°C). The average surface salinity is 34 psu and there is a shallow thermocline (20–40 m) that is nearly stable (Fiedler and Talley 2006).

In order to construct the fish checklist of AB, information of several field surveys with different method was gathered. These methods include visual census, video-transects, sub-aquatic photography, spearfishing captures, anesthesia of intertidal and subtidal reef fishes, and capture of pelagic and soft-bottom demersal fishes using beach seines and gill nets. The fish associated with oyster seed collectors were also recorded, and an assessment of commercial fish landings was performed on the beach.

Visual censuses of subtidal reef fishes were carried out at four sites within the bay during 13 sampling trips, from October 2001 to January 2009 (Fig. 1; Table 1). Visual censuses were implemented by skin divers over transects 50 m long by 5 m wide (500 m²/station). All species and their abundances were recorded. Video-transects and subaquatic photography were used at 21 sites within AB and its surroundings; 106 samples were obtained from December 2000 to October 2011 (Fig. 1; Table 1). Captures with spearfishing trips were performed at six sites during eight non-systematic trips in 2010. Intertidal fishes were sampled during 16 diurnal samplings carried out from September 2000 to November 2004 in the tide pools of four rocky reefs (Fig. 1; Table 1). Fish were collected using manual aspersion pumps containing a solution of 10 % eugenol (clove oil) dissolved in ethanol; after 10 minutes the pool was thoroughly checked using dipnets.

Pelagic and demersal–pelagic fish were sampled opportunistically during 15 trips carried out from June 2003 to

Fig. 1 Location of the study area and sampling points in Acapulco Bay and its adjacent coastal zone. 1 Sinfonía del Mar, 2 La Angosta, 3 Siete Pulpos, 4 Los Pilares, 5 Caletilla, 6 Mágico Mundo Marino, 7 Caleta, 8 El Corsario, 9 Ensenada de Los Presos, 10 UNICAP, 11 Flamingos, 12 Manzanillo, 13 Bonanza, 14 Tlacopanocha, 15 Parque de la Reina, 16 Las Hamacas, 17 Tamarindos, 18 Hornos, 19 San Lorenzo, 20 Hornitos, 21 El Morro, 22 La Condesa, 23 Rio de Plata, 24 Punta del Guitarrón, 25 Puerto Márquez, 26 Majahua, 27 El Rincón, 28 Las Palmitas, 29 Playa de los enamorados, 30 El Ripial, 31 Hawai 0.5, 32 Rincón Roqueta



January 2004 at three sites within the bay (Fig. 1; Table 1). A 120-m-long by 2.5-m-wide gill net of 9-cm mesh size was used. This net was placed at dusk (1800 hours) perpendicular to the shoreline, and recovered the next morning (0600 hours). Soft-bottom fish were sampled monthly from November 1998 to November 1999 (Fig. 1) using a non-selective beach seine, with a radius of over 300 m. This net was thrown from a boat and then pulled by fishermen on the shore. All captured fish were identified and quantified as number of individuals and biomass per species. A total of 13 non-systematic samplings of cryptic fish associated with the artificial oyster seed collectors (*Pinctada mazatlanica* and *Pteria sterna*) were also performed; nets were placed at depths between 10 and 15 m at two sites within the bay (Fig. 1; Table 1) from July 2000 to December 2009.

Additionally, periodic visits were done to nine beaches where local fishermen unload their product, and an inventory of captured species was done. A total of 102 visits were carried out from November 2002 to January 2011 (Fig. 1; Table 1). A

few reference specimens were kept in 10 % formaldehyde, and later preserved in 70 % ethanol to be deposited at the ichthyological collection of the Unidad Académica de Ecología Marina (UAEM-CI) of the Universidad Autónoma de Guerrero.

The taxonomic identification of species was accomplished using keys and descriptions by Fischer et al. (1995) and Robertson and Allen (2008). Specialized bibliographies were also used for some groups (e.g., Briggs 1955; Castro-Aguirre and Espinoza-Pérez 1996; Espinosa-Pérez et al. 2004; Hoes and Reader 2001; Hubbs 1953; Stephens 1963; Stephens et al. 1966). Systematics followed criteria proposed by Nelson (2006) with modifications by Wiley and Johnson (2010). Genera and species are presented alphabetically.

In order to identify the dominant ecological attributes of the fish species found in AB and its adjacent coastal zone, the preferential habitat, reproductive strategy, and feeding mode of each species were recorded. Species were classified as follows according to their habitat: reef (R); soft-bottom–

Table 1 Sampling effort by year and method applied for fish assessment, and study sites in Acapulco Bay and adjacent zone

	VC	VT	SF	AN	GN	BS	OC	FL
1998						2		1
1999						10		
2000		1		4			4	
2001	1			7				18
2002	3			12				11
2003				8			2	6
2004	4			16	12			1
2005	1	10			3			1
2006	1	8						1
2007	1	31					7	72
2008	1	17						2
2009	1	16						
2010		4	48					2
2011		19						
Sampling effort	13	106	48	47	15	12	13	115
Sites	7, 19, 21, 30	2–4, 6–9, 15, 19, 21–24, 26–32	2, 9, 11, 13, 23, 32	7, 19, 21, 30, 32	12, 13, 32	16	8, 10	2, 6, 8, 12, 14, 16–18, 20

VC visual census, VT video transects, SP spearfishing, AN anesthetics, GN gillnets, BS beach seine, OC oyster collectors, FL fish landings

demersal (SBD); mixed-bottom–demersal (MBD); pelagic–demersal (PD, species that are demersal but also break into the water column); neritic–pelagic (NP, species associated with the upper part of the water column near the coastal zone); and oceanic–pelagic (OP) species. The reproductive strategies for each species were classified according to Balon (1989) and Elliot and Dewailly (1995) as: viviparous (V), species that give birth to complete juveniles and whose embryos obtain nutrients from yolk or directly from their mother. Oviparous species were sub-classified as: oviparous with pelagic eggs (OP), oviparous with benthic eggs and a pelagic phase (OBPP), oviparous with benthic eggs without a pelagic phase (OBWPP), oviparous with oral gestation (OOG), or oviparous with gestation in the vascularized ventral sac (OGVVS).

According to their diet preferences species were classified according to Gerking (1994) as: piscivores (Pisc), which are species whose diet consists mainly of fish (e.g., *Ablennes* sp.); opportunistic carnivores (OC), species that eat both fish and invertebrates alike (e.g., *Epinephelus* sp.); macrobenthivores (Macben), species that feed on bottom macroinvertebrates (e.g., *Bodianus* sp.); microbenthivores (Micben), species that feed on small bottom invertebrates (e.g., *Axoclinus* sp.); herbivores (Herb), species that consume living plant material (e.g., *Prionurus* sp.); zooplanktivores (Zoop), species that feed predominantly on zooplankton (e.g., *Chromis* sp.); omnivores (Omn), that feed on algae and a variety of invertebrates such as sponges, echinoderms, etc. (e.g., *Ophioblennius* sp.);

detrivores (Detr), species that feed on the bottom, selecting fine particles, benthic diatoms, filamentous algae, meiofauna, plant detritus, and inorganic sediments (e.g., *Mugil* sp.); and parasites (Par), species that feed on other fish, taking dermal tissue, mucus and scales (e.g., *Plagiotremus* sp.).

Finally, the zoogeographic affinity analysis of the ichthyofauna was performed following the Briggs (1974) basic scheme with modifications from Hastings (2000), Robertson et al. (2004) and Horn et al. (2006). The species were grouped using the following classification, which considers their area of natural distribution: SP: San Diegan province from Point Conception, California (34°N) to Magdalena Bay (~25°N), along the occidental coast of Baja California Sur. CP: Cortez province, includes the southern part of Magdalena Bay and the central and northern portion of the Gulf of California. In the Eastern coast of the Gulf, the province is isolated from the Mexican province by the Sinaloa gap, a band of approximately 368 km of sandy, muddy coast that extends between Topolobampo and Mazatlán, Sinaloa, Mexico (24°N). MP: Mexican province, includes the coast of Mexico from Mazatlán, up to the Isthmus of Tehuantepec, Oaxaca, Mexico (15°N). This province is separated from the CP by an expansion of 300 km of exposed shores to its west, between Mazatlán and the Baja California Peninsula, and to the north by the Sinaloa gap. PP: Panamic Province extends southward from El Salvador to nearby Cabo Blanco, north of Perú (4°S), including Colombia and Ecuador in South America and

Table 2 Systematic checklist of marine fish fauna of Acapulco Bay

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
CLASS CHONDRICHTHYES						
SUBDIVISION SELACHII						
ORDER CARCHARINIFORMES						
FAMILY CARCHARINIDAE						
<i>Carcharhinus cerdale</i> Gilbert, in Jordan & Evermann, 1898	Smalltail shark	2	AN	PD	V	Pisc
<i>Rhizoprionodon longurio</i> (Jordan & Gilbert, 1882)	Pacific sharpnose shark	1	SP-PP	PD	V	Pisc
FAMILY SPHYRNIDAE						
<i>Sphyrna lewini</i> (Griffith & Smith, 1834)	Scalloped hammerhead	1,2,8	CT	OP	V	Pisc
SUBDIVISION BATOIDEA						
ORDER TORPEDINIFORMES						
FAMILY NARCINIDAE						
<i>Narcine entemedor</i> Jordan & Starks, 1895	Giant electric ray	1,8	SP-PP	MBPD	V	OC
ORDER RAJIFORMES						
FAMILY RHINOBATIDAE						
<i>Rhinobatos glaucostigma</i> Jordan & Gilbert, 1883	Speckled guitarfish	1,8	CP-PP	MBPD	V	Macben
<i>Zapteryx xyster</i> Jordan & Evermann, 1896	Witch guitarfish	1	SM-PP	MBPD	V	Macben
SUBORDER RAJOIDEI						
FAMILY RAJIDAE						
<i>Raja equatorialis</i> Jordan & Bollman, 1890	Equatorial skate	8	SP-PP	MBPD	OBWPP	OC
ORDER MYLIOBATIFORMES						
FAMILY UROTRYGONIDAE						
<i>Urobatis halleri</i> (Cooper, 1863)	Round stingray	1,5,7	OP-PP	MBPD	V	OC
<i>Urotrygon aspidura</i> (Jordan & Gilbert, 1882)	Panamic stingray	8	CP-PP	MBPD	V	OC
<i>Urotrygon chilensis</i> (Günther, 1872)	Blotched stingray	1,8	CP-PCHP	MBPD	V	OC
<i>Urotrygon munda</i> Gill, 1863	Spiny stingray	1	CP-PCHP	MBPD	V	OC
<i>Urotrygon rogersi</i> (Jordan & Starks, 1895)	Thorny stingray	8	CP-PP	MBPD	V	OC
FAMILY DASYPATIDAE						
<i>Dasyatis longa</i> (Garman, 1880)	Longtail stingray	1,8	SP-PP	MBPD	V	OC
<i>Himantura pacifica</i> (Beebe & Tee-Van, 1941)	Pacific whiptail stingray	6	MP-PP	MBPD	V	OC
FAMILY GYMNURIDAE						
<i>Gymnura marmorata</i> (Cooper, 1864)	California butterfly ray	1,8	SP-PP	MBPD	V	OC
FAMILY MYLIOBATIDAE						
<i>Aetobatus laticeps</i> Gill, 1865	Spotted eagle ray	1,5,7,8	CT	NP	V	Macben
<i>Rhinoptera steindachneri</i> Evermann & Jenkins, 1892	Golden cownose ray	2,8	SP-PP	NP	V	Macben
CLASS ACTINOPTERYGII						
ORDER ELOPIFORMES						
FAMILY ELOPIDAE						
<i>Elops affinis</i> Regan, 1909	Machete	5	SP-PP	NP	OP	Pisc
ORDER ALBULIFORMES						
FAMILY ALBULIDAE						
<i>Albula esuncula</i> (Garman, 1899)	Cortez bonefish	1	SP-PP	PD	OP	OC
<i>Albula pacifica</i> (Beebe, 1942)		1,2				
ORDER ANGUILLIFORMES						
SUBORDER CONGROIDEI						
FAMILY OPHICHTHIDAE						
<i>Echiophis brunneus</i> (Castro-Aguirre & Suárez de los Cobos, 1983)	Fangjaw eel	1	CP-PP	SBPD	OP	Pisc
<i>Myrichthys tigrinus</i> Girard, 1859	Tiger snake eel	1,5,7	CP-PP	MBPD	OP	OC

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
<i>Ophichthus zophochir</i> Jordan & Gilbert, 1882	Yellow snake eel	1	OP-PCHP	SBPD	OP	OC
SUBORDER MURAENOIDEI						
FAMILY MURAENIDAE						
<i>Echidna nebulosa</i> (Ahl, 1789)	Starry moray	4,5	T	R	OP	Macben
<i>Echidna nocturna</i> (Cope, 1872)	Palenose moray	5	CP-PP	R	OP	Macben
<i>Gymnomuraena zebra</i> (Shaw, 1797)	Zebra moray	5	T	R	OP	Macben
<i>Gymnothorax castaneus</i> (Jordan & Gilbert, 1883)	Panamic green moray	4,5	CP-PP	R	OP	Pisc
<i>Gymnothorax panamensis</i> (Steindachner, 1876)	Masked moray	1,5	CP-PP	R	OP	OC
<i>Muraena lentiginosa</i> Jenyns, 1842	Jewel moray	4,5,7	CP-PP	R	OP	Pisc
ORDER CLUPEIFORMES						
SUBORDER CLUPEOIDEI						
FAMILY PRISTIGASTERIDAE						
<i>Opisthopterus dovii</i> (Günther, 1868)	Pacific longfin herring	1	CP-PP	NP	OP	Zoop
<i>Pliosteostoma lutipinnis</i> (Jordan & Gilbert, 1882)	Yellowfin herring	1	CP-PP	NP	OP	Zoop
FAMILY ENGRAULIDAE						
<i>Anchoa ischana</i> (Jordan & Gilbert, 1882)	Sharpnose anchovy	1	CP-PP	NP	OP	Zoop
FAMILY CLUPEIDAE						
<i>Harengula thrissina</i> (Jordan & Gilbert, 1882)	Flatiron herring	5	CP-PCHP	NP	OP	Zoop
<i>Opisthonema libertate</i> (Günther, 1867)	Deepbody thread herring	1,5	SP-PP	NP	OP	Zoop
ORDER GONORYNCHIFORMES						
SUBORDER CHANOIDEI						
FAMILY CHANIDAE						
<i>Chanos chanos</i> (Forsskål, 1775)	Milkfish	6	T	NP	OP	Zoop
ORDER SILURIFORMES						
FAMILY ARIIDAE						
<i>Cathorops</i> sp.		1				
<i>Occidentarius platypogon</i> (Günther, 1864)	Cominate sea catfish	2	SP-PP	SBPD	OOG	OC
<i>Sciades seemanni</i> (Günther, 1864)	Tete sea catfish	1,2,8	CP-PP	SBPD	OOG	OC
ORDER AULOPIFORMES						
SUBORDER SYNODONTOIDEI						
FAMILY SYNODONTIDAE						
<i>Synodus lacertinus</i> Gilbert, 1890	Calico lizardfish	5,7	CP-PCHP	MBPD	OP	Pisc
<i>Synodus scituliceps</i> Jordan & Gilbert, 1882	Lance lizardfish	1	SP-PCHP	SBPD	OP	Pisc
ORDER BERYCIFORMES						
FAMILY HOLOCENTRIDAE						
<i>Myripristis leiognathus</i> Valenciennes, 1846	Panamic soldierfish	2,5,7,8	SP-PP	R	OP	Zoop
<i>Sargocentron suborbitalis</i> (Gill, 1863)	Tinsel squirrelfish	4,5,7	CP-PP	R	OP	Micben
ORDER MUGILIFORMES						
FAMILY MUGILIDAE						
<i>Chaenomugil proboscideus</i> (Günther, 1861)	Snouted mullet	4,5	CP-PP	PD	OP	Detr
<i>Mugil cephalus</i> Linnaeus, 1758	Striped mullet	5,6,7,8	CT	PD	OP	Detr
<i>Mugil curema</i> Valenciennes, 1836	White mullet	1,5,8	CT	PD	OP	Detr
ORDER GASTEROSTEIFOMES						
SUBORDER SYNGNATHOIDEI						
FAMILY SYNGNATHIDAE						
<i>Hippocampus ingens</i> Girard, 1858	Pacific seahorse	1,5	OP-PCHP	MBPD	OGVVS	Zoop
FAMILY AULOSTOMIDAE						
<i>Aulostomus chinensis</i> (Linnaeus, 1766)	Chinese trumpetfish	5	T	R	OP	OC

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
FAMILY FISTULARIIDAE						
<i>Fistularia commersonii</i> Rüppell, 1838	Reef cornetfish	5,8	CT	R	OP	Pisc
<i>Fistularia corneta</i> Gilbert & Starks, 1904	Deepwater cornetfish	1	OP-PCHP	PD	OP	Pisc
ORDER ATHERINIFORMES						
FAMILY ATHERINOPSIDAE						
<i>Atherinella eriarcha</i> Jordan & Gilbert, 1882	Longfin silverside	4	CP-PP	NP	OBPP	Zoop
ORDER BELONIFORMES						
SUBORDER EXOCOETOIDEI						
FAMILY BELONIDAE						
<i>Ablennes hians</i> (Valenciennes, 1846)	Flat needlefish	5,6	CT	OP	OBPP	Pisc
FAMILY BELONIDAE						
<i>Platybelone argalus</i> (Lesueur, 1821)	Keeltail needlefish	5	CT	NP	OBPP	OC
<i>Strongylura exilis</i> (Girard, 1854)	California needlefish	1,8	OP-PP	NP	OBPP	Pisc
<i>Tylosurus fodiator</i> Jordan & Gilbert, 1882	Houndfish	6	CT	NP	OBPP	Pisc
FAMILY EXOCOETIDAE						
<i>Fodiator rostratus</i> (Günther, 1866)	Sharpchin flyingfish	1,6,8	SP-PCHP	NP	OP	Zoop
FAMILY HEMIRAMPHIDAE						
<i>Hemiramphus saltator</i> Gilbert & Starks, 1904	Longfin halfbeak	1,5,8	CP-PP	NP	OP	Zoop
ORDER ACANTHURIFORMES						
FAMILY ZANCLIDAE						
<i>Zanclus cornutus</i> (Linnaeus, 1758)	Moorish idol	5	T	R	OP	Omn
FAMILY ACANTHURIDAE						
<i>Acanthurus nigricans</i> (Linnaeus, 1758)	Goldrim surgeonfish	6	T	R	OP	Herb
<i>Acanthurus xanthopterus</i> Valenciennes, 1835	Yellowfin surgeonfish	1,5,7	T	R	OP	Herb
<i>Prionurus punctatus</i> Gill, 1862	Yellowtail surgeonfish	2,4,5,7	CP-PP	R	OP	Herb
ORDER BATRACHOIDIFORMES						
FAMILY BATRACHOIDIDAE						
<i>Batrachoides waltersi</i> Collette & Russo, 1981	Multipored toadfish	1,8	MP-PP	SBPD	OBWPP	OC
<i>Porichthys analis</i> Hubbs & Schultz, 1939	Darkedge midshipman	1	CP-MP	SBPD	OBWPP	OC
ORDER BLENNIFORMES						
FAMILY TRIPTERYGIIDAE						
<i>Axoclinus lucillae</i> Fowler, 1944	Panamic triplefin	4	MP-PP	R	OBPP	Micben
<i>Axoclinus storeyae</i> (Brock, 1940)		4	CP-MP	R	OBPP	Micben
<i>Enneanectes carminalis</i> (Jordan & Gilbert, 1882)	Carmine triplefin	4	CP-PP	R	OBPP	Micben
<i>Enneanectes reticulatus</i> Allen & Robertson, 1991	Flag triplefin	4	SP-CP	R	OBPP	Micben
FAMILY DACTYLOSCOPIDAE						
<i>Dactylagnus parvus</i> Dawson, 1976	Panamic stargazer	3	CP-PP		OBPP	Micben
FAMILY BLENNIIDAE						
<i>Entomacrodus chiostrictus</i> (Jordan & Gilbert, 1882)	Notchfin blenny	4	SP-PP	R	OBPP	Detr
<i>Hypsoblennius brevipinnis</i> (Günther, 1861)	Barnaclebill blenny	3,5	SP-PP	R	OBPP	Omn
<i>Ophioblennius steindachneri</i> Jordan & Evermann, 1898	Panamic fanged blenny	4,5,7	SP-PP	R	OBPP	Omn
<i>Plagiotremus azaleus</i> (Jordan & Bollman, 1890)	Sabertooth blenny	5	SP-PP	R	OBPP	Par
FAMILY CHAENOPSIDAE						
<i>Acanthemblemaria balanorum</i> Brock, 1940	Clubhead barnacle blenny	4	CP-PP	R	OBPP	Micben
<i>Acanthemblemaria macrospilus</i> Brock, 1940	Mexican barnacle blenny	4,5	CP-MP	R	OBPP	Micben
<i>Coralliozetus angelicus</i> (Böhlke & Mead, 1957)	Angel blenny	4	CP-MP	R	OBPP	Micben
<i>Stathmonotus lugubris</i> Böhlke, 1953	Mexican worm blenny	4	MP	R	OBPP	Micben

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
FAMILY LABRISOMIDAE						
<i>Labrisomus multiporosus</i> Hubbs 1953	Porehead blenny	3,4,5,7	SP-PP	R	OBPP	Micben
<i>Labrisomus striatus</i> Hubbs 1953	Green blenny	4,5,7	CP-MP	R	OBPP	Micben
<i>Labrisomus xanti</i> Gill, 1860	Largemouth blenny	4,5,7	SP-MP	R	OBPP	Micben
<i>Malacoctenus ebisui</i> Springer, 1959	Fishgod blenny	4,5	SP-PP	R	OBPP	Micben
<i>Malacoctenus polyporosus</i> Springer, 1959	Redside blenny	3,4,5	MP	R	OBPP	Micben
<i>Malacoctenus tetranemus</i> (Cope, 1877)	Throatspotted blenny	3	CP-PP	R	OBPP	Micben
<i>Malacoctenus zaca</i> Springer, 1959	Zaca blenny	3,4	CP-MP	R	OBPP	Micben
<i>Paraclinus mexicanus</i> (Gilbert, 1904)	Mexican blenny	3,4,5	CP-PP	R	OBPP	Micben
<i>Paraclinus stephensi</i> Rosenblatt & Parr, 1969	Professor blenny	4	MP	R	OBPP	Micben
<i>Paraclinus tanygnathus</i> Rosenblatt & Parr, 1969	Longjaw blenny	4	CP-MP	R	OBPP	Micben
ORDER CARANGIFORMES						
FAMILY NEMATISTIIDAE						
<i>Nematistius pectoralis</i> Gill, 1862	Roosterfish	1	SP-PP	NP	OP	Pisc
FAMILY CORYPHAENIDAE						
<i>Coryphaena hippurus</i> Linnaeus, 1758	Dolphinfish	8	CT	OP	OP	Pisc
FAMILY CARANGIDAE						
<i>Alectis ciliaris</i> (Bloch, 1787)	African pompano	1,2,5	CT	NP	OP	Pisc
<i>Caranx caballus</i> Günther, 1868	Green jack	1,2,5,6,8	OP-PCHP	NP	OP	Pisc
<i>Caranx caninus</i> Günther, 1867	Pacific crevalle jack	1,2,5,6,8	SP-PCHP	NP	OP	Pisc
<i>Caranx orthogrammus</i> Jordan & Gilbert, 1882	Island jack	2	T	NP	OP	Macben
<i>Caranx otrynter</i> Jordan & Gilbert, 1883	Threadfin jack	1,8	CP-PP	NP	OP	OC
<i>Caranx sexfasciatus</i> Quoy & Gaimard, 1825	Bigeye trevally	1,2,5,6,7,8	T	NP	OP	Pisc
<i>Caranx vinctus</i> Jordan & Gilbert, 1882	Cocinero	1,2,8	SP-PP	NP	OP	OC
<i>Chloroscombrus orqueta</i> Jordan & Gilbert, 1883	Pacific bumper	2,5,8	SP-PCHP	NP	OP	Zoop
<i>Decapterus macarellus</i> (Cuvier, 1833)	Mackerel scad	1,2	CT	OP	OP	Zoop
<i>Decapterus muroadsi</i> (Temminck & Schlegel, 1844)	Amberstripe scad	1	T	OP	OP	Zoop
<i>Elagatis bipinnulata</i> (Quoy & Gaimard, 1825)	Rainbow runner	6	CT	OP	OP	OC
<i>Gnathanodon speciosus</i> (Forsskål, 1775)	Golden trevally	5,6	T	NP	OP	Macben
<i>Hemicaranx leucurus</i> (Günther, 1864)	Yellowfin jack	1,2	CP-PP	NP	OP	OC
<i>Hemicaranx zelotes</i> Gilbert, 1898	Blackfin jack	1,2	CP-PP	NP	OP	OC
<i>Oligoplites altus</i> (Günther, 1868)	Longjaw leatherjack	1	SP-PCHP	NP	OP	Pisc
<i>Oligoplites refulgens</i> Gilbert & Starks, 1904	Shortjaw leatherjack	1,8	CP-PCHP	NP	OP	Pisc
<i>Oligoplites saurus</i> (Bloch & Schneider, 1801)	Leatherjack	1,2	AN	NP	OP	OC
<i>Selar crumenophthalmus</i> (Bloch, 1793)	Bigeye scad	1,2,5,7,8	CT	NP	OP	Zoop
<i>Selene brevoortii</i> (Gill, 1863)	Mexican lookdown	1,2,8	SP-PCHP	PD	OP	OC
<i>Selene orstedii</i> Lütken, 1880	Mexican moonfish	1,2	CP-PP	PD	OP	OC
<i>Selene peruviana</i> (Guichenot, 1866)	Pacific moonfish	1,2	SP-PCHP	PD	OP	Pisc
<i>Seriola peruana</i> Steindachner, 1881	Fortune jack	8	CP-PP	PD	OP	Pisc
<i>Seriola rivoliana</i> Valenciennes, 1833	Almaco jack	2,6	CT	OP	OP	Pisc
<i>Trachinotus kennedyi</i> Steindachner, 1876	Blackblotch pompano	1,4	SP-PP	PD	OP	OC
<i>Trachinotus paitensis</i> Cuvier, 1832	Paloma pompano	1,2	SP-PCHP	PD	OP	OC
<i>Trachinotus rhodopus</i> Gill, 1863	Gafftopsail pompano	1,2,5,6,8	SP-PCHP	NP	OP	Zoop
<i>Trachinotus</i> sp.		1				
<i>Trachurus symmetricus</i> (Ayres, 1855)	Jack mackerel	1	PS-PM	NP	OP	Zoop
ORDER GOBIESOCIFORMES						
SUBORDER GOBIESOCOIDEI						
FAMILY GOBIESOCIDAE						

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
<i>Arcos erythroptus</i> (Jordan & Gilbert, 1882)	Rockwall clingfish	3,4	CP-MP	R	OBPP	Omn
<i>Gobiesox adustus</i> Jordan & Gilbert, 1882	Panamic clingfish	3,5	CP-PP	R	OBPP	Micben
<i>Tomicodon boehlkei</i> Briggs 1955	Cortez clingfish	4	CP	R	OBPP	Omn
<i>Tomicodon petersii</i> (Garman, 1875)	Hourglass clingfish	4	MP-PP	R	OBPP	Omn
ORDER GOBIIFORMES						
SUBORDER GOBIOIDEI						
FAMILY GOBIIDAE						
SUBFAMILY GOBIINAE						
<i>Bathygobius ramosus</i> Ginsburg, 1947	Panamic frillfin	4,5,7	CP-PP	R	OBPP	Micben
<i>Coryphopterus urosphilus</i> Ginsburg, 1938	Redlight goby	4		R	OBPP	Micben
<i>Elacatinus punctulatus</i> (Ginsburg, 1938)	Redhead goby	3,5	CP-PP	R	OBPP	Micben
<i>Gobiosoma paradoxum</i> (Günther, 1861)	Paradox goby	3	CP-PP	R	OBPP	Micben
<i>Microgobius miraflorensis</i> Gilbert & Starks, 1904	Miraflores goby	1	MP-PP	SBPD	OBPP	Zoop
SUBORDER APOGONOIDEI						
FAMILY APOGONIDAE						
<i>Apogon dovii</i> Günther, 1862	Tailspot cardinalfish	5	MP-PP	R	OOG	Zoop
<i>Apogon pacificus</i> (Herre, 1935)	Pink cardinalfish	5,8	SP-PCHP	R	OOG	Zoop
<i>Apogon retrosella</i> (Gill, 1862)	Barspot cardinalfish	4,5,7	SP-PP	R	OOG	Zoop
ORDER LABRIFORMES						
FAMILY LABRIDAE						
<i>Bodianus diplotaenia</i> (Gill, 1862)	Mexican hogfish	4,5,6,7	SP-PCHP	R	OP	Macben
<i>Halichoeres chierchiai</i> di Caporiacco, 1947	Wounded wrasse	5	CP-PP	R	OP	Macben
<i>Halichoeres dispilus</i> (Günther, 1864)	Chameleon wrasse	4,5,7	SP-PP	R	OP	Macben
<i>Halichoeres nicholsi</i> (Jordan & Gilbert, 1882)	Spinster wrasse	4,5,7	CP-PP	R	OP	Macben
<i>Halichoeres notospilus</i> (Günther, 1864)	Banded wrasse	4,5	CP-PP	R		
<i>Halichoeres</i> sp.		5				
<i>Iniistius pavo</i> (Valenciennes 1840)	Peacock razorfish	5,6	T	R	OP	Macben
<i>Novaculichthys taeniourus</i> (Lacepède, 1801)	Rockmover wrasse	5,7	T	R	OP	Macben
<i>Thalassoma lucasanum</i> (Gill, 1862)	Cortez rainbow wrasse	4,5,7	SP-PP	R	OP	Omn
FAMILY SCARIDAE						
<i>Nicholsina denticulata</i> (Evermann & Radcliffe, 1917)	Loosetooth parrotfish	5	SP-PP	R	OP	Herb
<i>Scarus compressus</i> (Osburn & Nichols, 1916)	Azure parrotfish	6	CP-PP	R	OP	Herb
<i>Scarus perrico</i> Jordan & Gilbert, 1882	Bumphead parrotfish	4,5	CP-PP	R	OP	Herb
FAMILY POMACENTRIDAE						
<i>Abudefduf declivifrons</i> (Gill, 1862)	Mexican night sergeant	1,4,5	CP-PP	R	OBPP	Omn
<i>Abudefduf troschelii</i> (Gill, 1862)	Panamic sergeant major	1,3,4,5	SP-PP	R	OBPP	Zoop
<i>Chromis atrilobata</i> Gill, 1862	Scissortail chromis	5	SP-PCHP	R	OBPP	Zoop
<i>Microspathodon bairdii</i> (Gill, 1862)	Bumphead damselfish	5	CP-PP	R	OBPP	Omn
<i>Microspathodon dorsalis</i> (Gill, 1862)	Giant damselfish	4,5,7	CP-PP	R	OBPP	Omn
<i>Stegastes acapulcoensis</i> (Fowler, 1944)	Acapulco damselfish	1,2,4,5,7	CP-PP	R	OBPP	Omn
<i>Stegastes flavilatus</i> (Gill, 1862)	Beaubrummel	1,2,3,4,5,7	SP-PP	R	OBPP	Omn
ORDER LOPHIIFORMES						
SUBORDER LOPHIOIDEI						
FAMILY LOPHIIDAE						
<i>Lophiodes caularis</i> (Garman, 1899)	Spottedtail goosefish	1	SP-PCHP	SBPD	OP	Pisc
<i>Lophiodes spilurus</i> (Garman, 1899)	Threadfin goosefish	1	OP-PP	SBPD	OP	Pisc
SUBORDER ANTENNARIOIDEI						

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
FAMILY ANTENNARIIDAE						
<i>Fowlerichthys avalonis</i> (Jordan & Starks, 1907)	Roughjaw frogfish	1,3	SP-PCHP	MBPD	OP	OC
<i>Antennatus sanguineus</i> (Gill, 1863)	Sanguine frogfish	3	CP-PP	R	OP	OC
SUBORDER OGCOCEPHALOIDEI						
FAMILY OGCOCEPHALIDAE						
<i>Zalieutes elater</i> (Jordan & Gilbert, 1882)	Roundel batfish	1	OP-PP	SBPD	OP	Micben
ORDER OPHIDIIFORMES						
SUBORDER OPHIDIOIDEI						
FAMILY OPHIDIIDAE						
<i>Brotula clarkae</i> Hubbs, 1944	Pacific bearded brotula	8	CP-PP	MBPD	OP	OC
ORDER PERCIFORMES						
SUBORDER PERCOIDEI						
FAMILY CENTROPOMIDAE						
<i>Centropomus nigrescens</i> Günther, 1864	Black snook	2,8	CP-PP	PD	OP	Pisc
<i>Centropomus robalito</i> Jordan & Gilbert, 1882	Yellowfin snook	1,2,5,8	CP-PP	PD	OP	OC
FAMILY OPISTOGNATHIDAE						
<i>Opistognathus scops</i> (Jenkins & Evermann, 1889)	Bullseye jawfish	1	CP-PP	MBPD	OOG	OC
FAMILY PRIACANTHIDAE						
<i>Pristigenys serrula</i> (Gilbert, 1891)	Popeye catalufa	1,8	OP-PCHP	MBPD	OP	OC
FAMILY LUTJANIDAE						
<i>Hoplopagrus guentherii</i> Gill, 1862	Barred pargo	1,5	SP-PP	PD	OP	OC
<i>Lutjanus argentiventris</i> (Peters, 1869)	Amarillo snapper	1,2,3,5,6,7,8	SP-PCHP	PD	OP	OC
<i>Lutjanus colorado</i> Jordan & Gilbert, 1882	Colorado snapper	1,5,6,8	SP-PP	PD	OP	OC
<i>Lutjanus guttatus</i> (Steindachner, 1869)	Spotted rose snapper	1,2,5,8	CP-PCHP	PD	OP	OC
<i>Lutjanus inermis</i> (Peters, 1869)	Golden snapper	6,8	CP-PP	PD	OP	Zoop
<i>Lutjanus jordani</i> (Gilbert, 1898)	Whipper snapper	1,2,7	SP-PP	PD	OP	OC
<i>Lutjanus novemfasciatus</i> Gill, 1862	Pacific dog snapper	1,3,5,6,7,8	SP-PP	PD	OP	OC
<i>Lutjanus peru</i> (Nichols & Murphy, 1922)	Pacific red snapper	1,8	SP-PCHP	PD	OP	OC
FAMILY LOBOTIDAE						
<i>Lobotes pacificus</i> Gilbert, 1898	Pacific tripletail	8	SP-PP	NP	OP	OC
FAMILY GERREIDAE						
<i>Diapterus aureolus</i> (Jordan & Gilbert, 1882)	Golden mojarra	1,8	CP-PP	SBPD	OP	Macben
<i>Diapterus brevirostris</i> (Sauvage, 1879)	Peruvian mojarra	1,2,8	CP-PP	SBPD	OP	Macben
<i>Eucinostomus currani</i> Zahuranec, 1980	Pacific flagfin mojarra	1,2,5	SP-PCHP	SBPD	OP	Macben
<i>Eucinostomus dowii</i> (Gill, 1863)	Pacific spotfin mojarra	1,2	SP-PP	SBPD	OP	Macben
<i>Eucinostomus entomelas</i> Zahuranec, 1980	Darkspot mojarra	1	SP-PP	SBPD	OP	Macben
<i>Eucinostomus gracilis</i> (Gill, 1862)	Graceful mojarra	1,2,8	SP-PP	SBPD	OP	Macben
<i>Gerres simillimus</i> Reagan, 1907	Yellowfin mojarra	1,2,5,6	AN	SBPD	OP	Macben
FAMILY HAEMULIDAE						
<i>Anisotremus interruptus</i> (Gill, 1862)	Burrito grunt	1,2,5,6	SP-PP	PD	OP	OC
<i>Anisotremus</i> sp.		1				
<i>Anisotremus taeniatus</i> Gill, 1861	Panamic porkfish	1,5	CP-PP	R	OP	Macben
<i>Genyatremus dovii</i> (Günther, 1864)	Blackbarred grunt	1,8	MP-PP	SBPD	OP	Macben
<i>Genyatremus pacifici</i> (Günther, 1864)	Carruco grunt	1	MP-PP	PD	OP	Macben
<i>Haemulon flaviguttatum</i> Gill, 1862	Cortez grunt	1,2,5,8	SP-PP	PD	OP	Macben
<i>Haemulon maculicauda</i> (Gill, 1862)	Spottail grunt	2,5,6,7	CP-PP	PD	OP	Macben
<i>Haemulon scudderi</i> Gill, 1862	Mojarra grunt	1,4,5	CP-PP	PD	OP	OC
<i>Haemulon sexfasciatum</i> Gill, 1862	Graybar grunt	2,5,6,7	CP-PP	PD	OP	Macben

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
<i>Haemulon steindachneri</i> (Jordan & Gilbert, 1882)	Latin grunt	1,2,5,6	AN	PD	OP	Macben
<i>Haemulopsis axillaris</i> (Steindachner, 1869)	Yellowstripe grunt	2,8	CP-PP	SBPD	OP	Macben
<i>Haemulopsis elongatus</i> (Steindachner, 1879)	Elongate grunt	2,8	CP-PP	SBPD	OP	Macben
<i>Haemulopsis leuciscus</i> (Günther, 1864)	Raucous grunt	1,2,5,8	SP-PP	SBPD	OP	Macben
<i>Haemulopsis nitidus</i> (Steindachner, 1869)	Shining grunt	1,2,8	CP-PP	SBPD	OP	Macben
<i>Microlepidotus brevipinnis</i> (Steindachner, 1869)	Brassy grunt	1,8	CP-PP	PD	OP	Zoop
<i>Orthopristis chalceus</i> (Günther, 1864)	Humpback grunt	1,2,8	SP-PCHP	PD	OP	Macben
<i>Orthopristis reddingi</i> Jordan & Richardson, 1895	Bronzestriped grunt	1	SP-MP	PD	OP	Macben
<i>Pomadasys macracanthus</i> (Günther, 1864)	Longspine grunt	1	CP-PP	SBPD	OP	Macben
<i>Pomadasys panamensis</i> (Steindachner, 1876)	Panamic grunt	1	CP-PP	PD	OP	OC
<i>Xenichthys xanti</i> Gill, 1863	Longfin salema	2,5,8	CP-PCHP	PD	OP	Zoop
FAMILY SPARIDAE						
<i>Calamus brachysomus</i> (Lockington, 1880)	Pacific porgy	7,8	SP-PCHP	MBPD	OP	Macben
FAMILY POLYNEMIDAE						
<i>Polydactylus approximans</i> (Lay & Bennett, 1839)	Blue bobo	1,2,8	OP-PCHP	SBPD	OP	OC
<i>Polydactylus opercularis</i> (Gill, 1863)	Yellow bobo	1,2,8	SP-PCHP	SBPD	OP	OC
FAMILY SCIAENIDAE						
<i>Cynoscion phoxocephalus</i> Jordan & Gilbert, 1882	Sharpnose corvina	1	CP-PP	PD	OP	OC
<i>Cynoscion reticulatus</i> (Günther, 1864)	Striped corvina	1,2,8	CP-PP	PD	OP	OC
<i>Cynoscion squamipinnis</i> (Günther, 1867)	Scalyfin corvina	2	CP-PP	PD	OP	OC
<i>Cynoscion stolzmanni</i> (Steindachner, 1879)	Yellowtail corvina	2	CP-PP	PD	OP	OC
<i>Cynoscion xanthulus</i> Jordan & Gilbert, 1882	Orangemouth corvina	2,8	SP-MP	PD	OP	OC
<i>Larimus acclivis</i> Jordan & Bristol, 1898	Steeplined drum	1,2	SP-PP	PD	OP	Zoop
<i>Larimus effulgens</i> Gilbert, 1898	Shining drum	1	CP-PP	PD	OP	Zoop
<i>Larimus pacificus</i> Jordan & Bollman, 1890	Pacific drum	1	CP-PP	PD	OP	Zoop
<i>Menticirrhus panamensis</i> (Steindachner, 1875)	Panama kingfish	2	SP-PCHP	SBPD	OP	Macben
<i>Micropogonias altipinnis</i> (Günther, 1864)	Golden croaker	2,8	CP-PP	PD	OP	OC
<i>Micropogonias ectenes</i> (Jordan & Gilbert, 1882)	Slender croaker	2	CP-MP	PD	OP	Macben
<i>Odontoscion xanthops</i> Gilbert, 1898	Yelloweye croaker	5	CP-PP	R	OP	Zoop
<i>Ophioscion imiceps</i> (Jordan & Gilbert, 1882)	Blinkard croaker	1	MP-PP	SBPD	OP	Macben
<i>Paralanchurus goodei</i> Gilbert, 1898	Angel croaker	2	CP-PP	SBPD	OP	Macben
<i>Pareques fuscovittatus</i> (Kendall & Radcliffe, 1912)	Festive drum	2,5	MP	R	OP	Macben
<i>Stellifer illecebrosus</i> Gilbert, 1898	Silver stardrum	1	MP-PP	SBPD	OP	Macben
<i>Umbrina analis</i> Günther, 1868	Longspine croaker	2	CP-PP	SBPD	OP	Macben
<i>Umbrina bussingi</i> López, 1980	Bigeye croaker	1	CP-PP	PD	OP	Macben
<i>Umbrina xanti</i> Gill, 1862	Surf croaker	1,2,5,8	CP-PCHP	PD	OP	Macben
FAMILY MULLIDAE						
<i>Mulloidichthys dentatus</i> (Gill, 1862)	Mexican goatfish	1,2,5,6	CP-PP	R	OP	Macben
<i>Pseudupeneus grandisquamis</i> (Gill, 1863)	Bigscale goatfish	1,5,7,8	SP-PCHP	SBPD	OP	Macben
FAMILY KYPHOSIDAE						
<i>Kyphosus elegans</i> (Peters, 1869)	Cortez sea chub	1,2,5	CP-PP	R	OP	Herb
<i>Kyphosus vaigensis</i> (Quoy & Gaimard 1825)	Blue-bronze chub	1,2,5,8	SP-PP	R	OP	Herb
<i>Sectator ocyurus</i> (Jordan & Gilbert, 1882)	Bluestriped chub	2,5,6	T	NP	OP	Zoop
FAMILY EPHIPPIDAE						
<i>Chaetodipterus zonatus</i> (Girard, 1858)	Pacific spadefish	1,2,6,8	SP-PP	PD	OP	Macben
<i>Parapsettus panamensis</i> Steindachner, 1876	Panama spadefish	1,2,7,8	CP-PP	PD	OP	Omn

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
FAMILY CHAETODONTIDAE						
<i>Chaetodon humeralis</i> Günther, 1860	Threebanded butterflyfish	1,2,4,5,7	SP-PCHP	MBPD	OP	Omn
<i>Johnrandallia nigriristris</i> (Gill, 1862)	Barberfish	2,4,5,7,8	CP-PCHP	R	OP	Omn
FAMILY POMACANTHIDAE						
<i>Holacanthus passer</i> Valenciennes, 1846	King angelfish	5,7	SP-PP	R	OP	Omn
<i>Pomacanthus zonipectus</i> (Gill, 1862)	Cortez angelfish	1,4,5,7	SP-PP	R	OP	Omn
FAMILY CIRRHITIDAE						
<i>Cirrhichthys oxycephalus</i> (Bleeker, 1855)	Coral hawkfish	7	T	R	OP	Micben
<i>Cirrhitis rivulatus</i> Valenciennes, 1846	Giant hawkfish	4,5,6	CP-PP	R	OP	Macben
ORDER PLEURONECTIFORMES						
SUBORDER PLEURONECTOIDEI						
FAMILY BOTHIDAE						
<i>Bothus leopardinus</i> (Günther, 1862)	Pacific leopard flounder	1,2	SP-PP	SBPD	OP	Macben
<i>Engyophrys sancti laurentii</i> Jordan & Bollman, 1890	Speckledtail flounder	1	SP-PCHP	SBPD	OP	Macben
<i>Monolene asaedai</i> Clark, 1936	Dark flounder	1	CP-PP	SBPD	OP	Micben
<i>Perissias taeniopterus</i> (Gilbert, 1890)	Flag flounder	1	SP-PP	SBPD	OP	OC
FAMILY PARALICHTHYIDAE						
<i>Ancylosetta dendritica</i> Gilbert, 1890	Threespot sand flounder	1	CP-PP	SBPD	OP	OC
<i>Citharichthys gilberti</i> Jenkins & Evermann, 1889	Bigmouth sanddab	1,2	SP-PP	SBPD	OP	OC
<i>Citharichthys platophrys</i> Gilbert, 1891	Small sanddab	1,8	CP-PCHP	SBPD	OP	OC
<i>Cyclosetta panamensis</i> (Steindachner, 1876)	Panamic flounder	1,2	CP-PP	SBPD	OP	OC
<i>Cyclosetta querna</i> (Jordan & Bollman, 1890)	Toothed flounder	1,8	CP-PCHP	SBPD	OP	OC
<i>Etropus crossotus</i> Jordan & Gilbert, 1882	Fringed flounder	1,2,8	AN	SBPD	OP	OC
<i>Hippoglossina tetrophthalma</i> (Gilbert, 1890)	Foureyeye flounder	1,8	SP-PCHP	SBPD	OP	OC
<i>Paralichthys woolmani</i> Jordan & Williams, 1897	Dappled flounder	1,7	SP-PCHP	SBPD	OP	OC
FAMILY ACHIRIDAE						
<i>Achirus mazatlanus</i> (Steindachner, 1869)	Pacific lined sole	1	CP-PP	SBPD	OP	Macben
<i>Achirus scutum</i> (Günther, 1862)	Network sole	1	CP-PP	SBPD	OP	Macben
<i>Trinectes fonsecensis</i> (Günther, 1862)	Spottedfin sole	1	CP-PP	SBPD	OP	Macben
FAMILY CYNOGLOSSIDAE						
<i>Symphurus chabanaudi</i> Mahadeva & Munroe, 1990	Darkcheek tonguefish	1	OP-PP	SBPD	OP	Micben
<i>Symphurus elongatus</i> (Günther, 1868)	Elongate tonguefish	1,8	MP-PP	SBPD	OP	Micben
ORDER SCOMBRIFORMES						
FAMILY SPHYRAENIDAE						
<i>Sphyraena ensis</i> Jordan & Gilbert, 1882	Mexican barracuda	8	SP-PCHP	NP	OP	Pisc
FAMILY SCOMBRIDAE						
<i>Euthynnus lineatus</i> Kishinouye, 1920	Black skipjack	1,5,6	SP-PP	OP	OP	Pisc
<i>Katsuwonus pelamis</i> (Linnaeus, 1758)	Skipjack tuna	8	CT	OP	OP	Pisc
<i>Scomber japonicus</i> Houttuyn, 1782	Pacific chub mackerel	7	T	NP	OP	Zoop
<i>Scomberomorus sierra</i> Jordan & Starks, 1895	Pacific sierra	1,2,6,8	SP-PCHP	NP	OP	Pisc
FAMILY ISTIOPHORIDAE						
<i>Istiophorus platypterus</i> (Shaw, 1792)	Sailfish	8	T	OP	OP	Pisc
ORDER SCORPAENIFORMES						
SUBORDER SCORPAENOIDEI						
FAMILY SCORPAENIDAE						
<i>Scorpaena histrio</i> Jenyns, 1840	Player scorpionfish	4,5	SP-PCHP	MBPD	OP	OC
<i>Scorpaena mystes</i> Jordan & Starks, 1895	Stone scorpionfish	1,4,5,7	SP-PCHP	MBPD	OP	OC
<i>Scorpaena russula</i> Jordan & Bollman, 1890	Reddish scorpionfish	1	SP-PP	SBPD	OP	OC

Table 2 (continued)

Species	Common name	Field records	Icthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
<i>Scorpaenodes xyris</i> (Jordan & Gilbert, 1882)	Rainbow scorpionfish	3	SP-PP	R	OP	OC
SUBORDER PLATYCEPHALOIDEI						
FAMILY TRIGLIDAE						
<i>Bellator gymnostethus</i> (Gilbert, 1892)	Nakedbelly searobin	1	SP-PCHP	SBPD	OP	Micben
<i>Prionotus ruscarius</i> Gilbert & Starks, 1904	Rough searobin	8	CP-PCHP	SBPD	OP	Macben
SUBORDER SERRANOIDEI						
FAMILY SERRANIDAE						
SUBFAMILY SERRANINAE						
<i>Diplectrum eumelum</i> Rosenblatt & Johnson, 1974	Orange-spotted sand perch	1,8	CP-PP	SBPD	OP	OC
<i>Diplectrum pacificum</i> Meek & Hildebrand, 1925	Pacific sand perch	1,2	SP-PP	SBPD	OP	OC
<i>Paralabrax loro</i> Walford, 1936	Parrot sand bass	5	CP-PP	MBPD	OP	OC
<i>Paralabrax maculatofasciatus</i> (Steindachner, 1868)	Spotted sand bass	7	OP-MP	PD	OP	OC
<i>Serranus psittacinus</i> Valenciennes, 1846	Barred serrano	5,7	SP-PCHP	R	OP	OC
<i>Serranus</i> sp.		8				
SUBFAMILY EPINEPHELINAE						
<i>Alphestes immaculatus</i> Breder, 1936	Pacific mutton hamlet	3	CP-PP	MBPD	OP	OC
<i>Alphestes multiguttatus</i> (Günther, 1867)	Rivulated mutton hamlet	1,2,3,4,5,7,8	CP-PP	MBPD	OP	OC
<i>Cephalopholis colonus</i> (Valenciennes, 1846)	Pacific creolefish	6	SP-PP	R	OP	Zoop
<i>Cephalopholis panamensis</i> (Steindachner, 1877)	Panama graysby	2,5,6,8	CP-PP	R	OP	Pisc
<i>Epinephelus analogus</i> Gill, 1863	Spotted cabrilla	1,2,8	SP-PCHP	MBPD	OP	OC
<i>Epinephelus labriformis</i> (Jenyns, 1840)	Flag cabrilla	3,4,5,7	SP-PP	R	OP	OC
<i>Epinephelus quinquefasciatus</i> Bocourt, 1868	Goliath grouper	1	AN	MBPD	OP	Pisc
<i>Hyporthodus acanthistiis</i> (Gilbert, 1892)	Gulf coney	1,8	SP-PP	MBPD	OP	OC
<i>Hyporthodus niphobles</i> Gilbert & Starks, 1897	Star-studded grouper	3,8	SP-PP	MBPD	OP	OC
<i>Pseudogramma thaumasium</i> (Gilbert, 1900)	Pacific reef bass	3,7	CP-PP	R	OP	Micben
<i>Rypticus nigripinnis</i> Gill, 1861	Twice-spotted soapfish	5	CP-PP	MBPD	OP	Pisc
ORDER STROMATEIFORMES						
FAMILY STROMATEIDAE						
<i>Peprilus medius</i> (Peters, 1869)	Pacific harvestfish	8	CP-PCHP	NP	OP	Zoop
ORDER TETRAODONTIFORMES						
SUBORDER BALISTOIDEI						
FAMILY BALISTIDAE						
<i>Balistes polylepis</i> Steindachner, 1876	Finescale triggerfish	1,2,5,6,7,8	AP-PCHP	PD	OBPP	Macben
<i>Pseudobalistes naufragium</i> (Jordan & Starks, 1895)	Blunthead triggerfish	1,6,8	CP-PCHP	PD	OBPP	Macben
<i>Sufflamen verres</i> (Gilbert & Starks, 1904)	Orangeside triggerfish	1,5,6	SP-PP	R	OBPP	Macben
FAMILY MONACANTHIDAE						
<i>Aluterus scriptus</i> (Osbeck, 1765)	Scrawled filefish	1,2,5,6,8	CT	R	OBPP	Omn
<i>Cantherhines dumerilii</i> (Hollard, 1854)	Barred filefish	1,5	T	R	OBPP	Omn
FAMILY OSTRACIIDAE						
<i>Ostracion meleagris</i> Shaw, 1796	Spotted boxfish	1,5,7	T	R	OP	Omn
SUBORDER TETRAODONTOIDEI						
FAMILY TETRAODONTIDAE						
<i>Arothron hispidus</i> (Linnaeus, 1758)	Stripebelly puffer	1,5,7	T	R	OBPP	Omn
<i>Arothron meleagris</i> (Lacépède, 1798)	Guineafowl puffer	1,5,7,8	T	R	OBPP	Omn
<i>Canthigaster punctatissima</i> (Günther, 1870)	Spotted sharpnose puffer	5	CP-PP	R	OBPP	Omn
<i>Sphoeroides annulatus</i> (Jenyns, 1842)	Bullseye puffer	1,5,8	SP-PCHP	MBPD	OBPP	Macben
<i>Sphoeroides lobatus</i> (Steindachner, 1870)	Longnose puffer	1,5,7	SP-PCHP	MBPD	OBPP	Macben

Table 2 (continued)

Species	Common name	Field records	Ichthyogeographic affinities	Habitat	Reproduction strategy	Feeding mode
<i>Sphaeroides trichocephalus</i> (Cope, 1870)	Pygmy puffer	1	CP-PCHP	MBPD	OBPP	Micben
<i>Sphaeroides</i> sp.		1,8		MBPD	OBPP	Macben
FAMILY DIODONTIDAE						
<i>Chilomycterus reticulatus</i> (Linnaeus, 1758)	Spotfin burrfish	1,7,8	CT	MBPD	OP	Macben
<i>Diodon holocanthus</i> Linnaeus, 1758	Balloonfish	1,5	CT	MBPD	OP	Macben
<i>Diodon hystrix</i> Linnaeus, 1758	Porcupinefish	1,5,8	CT	MBPD	OP	Macben
ORDER TRACHINIFORMES						
FAMILY URANOSCOPIDAE						
<i>Astroscopeus zephyreus</i> Gilbert & Starks, 1897	Pacific stargazer	2	SP-PCHP	SBPD	OP	OC
<i>Kathetostoma averruncus</i> Jordan & Bollman, 1890	Smooth stargazer	1	OP-PP	SBPD	OP	Pisc

Field records: beach seine, 2 gill net, 3 oyster seed collectors, 4 anesthetic solution, 5 visual census, 6 spearfishing, 7 subaquatic photography, 8 Fish landings

Ichthyogeographic affinity: *AP* Aleutian province; *OP* Oregonian province; *SP* San Diegan province; *CP* Cortez province; *MP* Mexican province; *PP* Panamic province; *CT* Circumtropical; *T* Transpacific species; *AN* Amphiamerican species; *PCHP*: Peruvian-Chilean province.

Habitat: *R* reef species, *SBD* soft -bottom–demersal, *MBD* mixed-bottom–demersal, *PD* pelagic–demersal, *NP* neritic–pelagic, *OP* oceanic–pelagic

Reproductive strategies: *V* viviparous, *OP* oviparous with pelagic eggs, *OBPP* oviparous with benthic eggs and pelagic phase, *OBWPP* oviparous with benthic eggs without pelagic phase, *OGVVS* oviparous with gestation in the vascularized ventral sac, *OOG* oviparous with oral gestation.

Feeding mode: *Macben* macrobenthivores, *Micben* microbenthivores, *OC* opportunistic carnivores, *Pisc* piscivores, *Herb* herbivores, *Zoop* zooplanktivores, *Detr* detritivores, *Omn* omnivores, *Par* parasites (guild codes see “Materials and methods”)

oceanic islands of the region (Coco, Malpelo, Gorgona, etc.). Between this province and the previous there is an extensive sandy coast line (Central America gap), of approximately 1,000 km long between the Gulf of Tehuantepec (south of Mexico) and El Salvador. PCHP: Peruvian-Chilean province extends from Sechura Bay (5°S) towards northern Isla Chiloé in Chile (41°S). CT: Circumtropical are fish species of wide distribution in the tropical seas of the world. T: Includes Transpacific species [considered by Castro-Aguirre et al. 2006 like Amphi-Pacific species] distributed on both ends of the Pacific barrier, Tropical Eastern Pacific (TEP), Central Pacific and the Tropical Western Pacific (TWP). AN: Amphi-American species with distribution on both sides of the Centroamerican Isthmus: TEP and Western Atlantic.

Results and discussion

A systematic checklist of the marine ichthyofauna of Acapulco Bay and its adjacent coastal zone is presented, based on 8 sampling methods and over 10 years of field work. The checklist includes 292 species from 192 genera, 82 families, 33 orders and 2 classes (Table 2). This species richness represents 22.7 % of all coastal species (1,285 species) known for the Tropical Eastern Pacific (TEP) (Robertson and Allen 2008). The orders that contributed the greatest number of families and genera, and the highest species richness were Perciformes, Carangiformes,

Blenniiformes, Scorpaeniformes, and Labriformes, while the orders Torpediniformes, Elopiformes, Gonorynchiformes, Ophidiiformes, Atheriniformes, and Stromateiformes contributed with only one family, one genus, and one species (Table 3).

The bony fish families with the highest number of species were the Carangidae (28), Haemulidae (20), Sciaenidae (19), and Serranidae (17), while the elasmobranch family with the highest number of species was Urotrygonidae (5). These same families are the most speciose in the Mexican Tropical Pacific (MTP); Sciaenidae has 82 species, while Carangidae, Haemulidae, and Serranidae have between 35 and 56 species (Amezcu-Linares 2009; Robertson and Allen 2008). The genera with the highest richness were *Lutjanus* (7 species), *Caranx* (6 species), and *Haemulon*, *Cynoscion*, and *Halichoeres* (five species each).

The variety of methods employed in sampling the fish species of Acapulco Bay and its adjacent coastal zone, in addition of the sampling effort in long time frame, allowed us to elaborate a highly representative systematic list. The species richness reported in this study is higher than previously reported by Ramírez-Hernández and Páez (1965), with 176 species for the entire coast of the state of Guerrero; despite the fact that these authors sampled using various fishing methods (drag nets, cast nets, beachseines, hooks, etc.) in diverse environments (estuaries and lagoons, rocky reefs, soft-bottom continental platforms, etc.) and at different depths. This checklist also surpassed the demersal fish richness reported by Amézcu-Linares (1996), with 166 species for the

Table 3 Fish families, genera and species for every order presented in the checklist of the ichthyofauna of Acapulco Bay, Mexico

Order	Family	Genera	Species
PERCIFORMES	16	41	75
CARANGIFORMES	3	14	30
BLENNIFORMES	5	13	24
SCORPAENIFORMES	3	13	23
LABRIFORMES	3	11	19
PLEURONECTIFORMES	4	13	17
TETRAODONTIFORMES	5	11	16
MYLIOBATIFORMES	4	7	10
ANGUILLIFORMES	2	7	9
GOBIIFORMES	2	6	8
BELONIFORMES	3	6	6
SCOMBRIFORMES	3	6	6
CLUPEIFORMES	3	5	5
LOPHIIFORMES	3	4	5
GASTEROSTEIFOMES	3	3	4
GOBIESOCIFORMES	1	3	4
CARCHARINIFORMES	2	3	3
RAJIFORMES	2	3	3
SILURIFORMES	1	3	3
MUGILIFORMES	1	2	3
ACANTHURIFORMES	2	3	3
ALBULIFORMES	1	1	2
AULOPIFORMES	1	1	2
BATRACHOIDIFORMES	1	2	2
BERYCIFORMES	1	2	2
TRACHINIFORMES	1	2	2
TORPEDINIFORMES	1	1	1
ELOPIFORMES	1	1	1
GONORYNCHIFORMES	1	1	1
OPHIDIIFORMES	1	1	1
ATHERINIFORMES	1	1	1
STROMATEIFORMES	1	1	1

continental platform of the state, and 257 species for the entire coast of Michoacán reported by Madrid-Vera et al. (1998). The present study also surpasses the species richness reported for bays or similar systems in the MTP ecosystem (64 species, Bahía San Agustín Oaxaca, Ramírez-Gutiérrez et al. 2007; 58 species, Cacaluta Oaxaca, López-Pérez et al. 2008; 112 species, Mazunte-Huatulco Oaxaca, López-Pérez et al. 2010; 89 species, coast of Oaxaca, López-Pérez et al. 2013). The differences observed in all these studies may be due to the methods used and the sampling effort rather than local factors for each study site. This is also likely a consequence of the lack of scientific studies in the MTP.

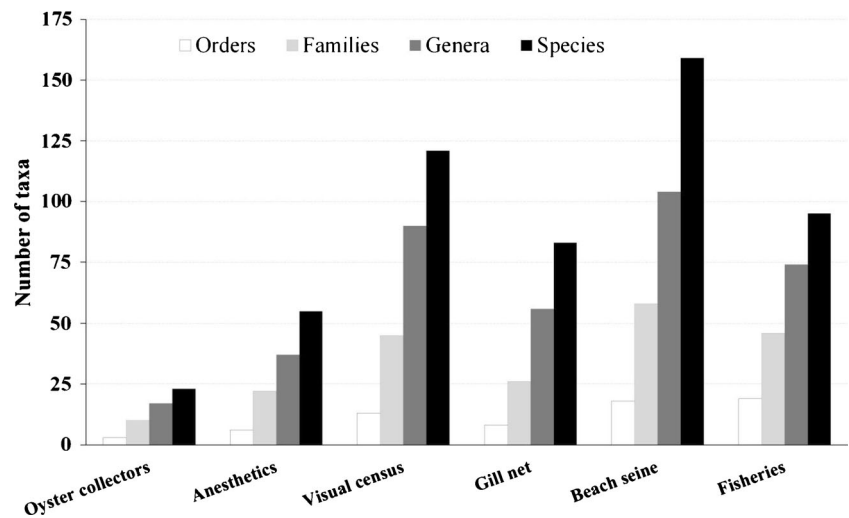
The species richness found by family varied according to the sampling method. The beach seine and gill-net yielded the

highest species richness for the Carangidae (22 and 18 species), Haemulidae (15 and 11 species), and Sciaenidae (9 and 12 species) families. The families with highest species number obtained while sampling rocky reefs by visual census were the Haemulidae and Labridae (9 species), and Pomacentridae (7 species). Anesthesia and oyster seed collectors yielded mostly Labrisomidae and Tripterygiidae (Table 2); these families have not been well studied and are of difficult to access using other sampling methods. In general, the family Carangidae had the highest species richness with 28 of the 34 species in this family, which are distributed in the TEP region, 19 are endemic to this region (Robertson and Allen 2008). Amongst the Carangidae species, the genera *Caranx* and *Selar* are the most common in the region; they are active predators that spend most of their time roaming reef zones in search of food, they have a well-developed swimming capacity that allows them to cover great distances in short periods of time (Claro 1994; Sierra et al. 1994).

Species richness and composition also varied with the sampling methods used (Table 2; Fig. 2). The highest richness was obtained with beach seines (159 species), and the lowest with seed oyster collectors (23 species). Using beach seines, the highest abundances were (Fig. 3): *Caranx caballus* (37 %), *Selar crumenophthalmus* (35.6 %) and *Gerres cinereus* (2.9 %). The dominant pelagic-coastal species captured with gillnets were: *Lutjanus guttatus* (11.9 %), *C. caballus* (10.5 %), and *S. crumenophthalmus* (8.4 %). The species recorded with visual censuses on rocky reefs were (Fig. 3): *Chromis atrilobata* (15.9 %), *Stegastes acapulcoensis* (12.3 %), and *Thalassoma lucasanum* (9.4 %). The dominant species in the intertidal zone were *Abudefduf troschelii* (12.3 %), *A. declivifrons* (11.4 %), and *Bathygobius ramosus* (6.5 %), and finally the most abundant species using oyster seed collectors were *Gobiosoma paradoxum* (59.9 %) and *Elacatinus puncticulatus* (8.3 %).

The ichthyofauna of Acapulco Bay and nearby coastal areas was made up by species associated with several habitats (Fig. 4). Demersal-pelagic species dominated (148 species); most species belong to commercially important families such as Lutjanidae, Haemulidae, and Sciaenidae (Table 3). There was also an important component of species associated with reef systems (Fig. 4). Within this component there are two groups: one with small species with cryptic colorations and habits belonging to families such as Labrisomidae, Chaenopsidae, Blenniidae, Tripterygiidae, and Gobiidae, and the other group comprised of conspicuous species, mostly mobile and of larger size, belonging to families such as Labridae, Pomacentridae, Acanthuridae, Scaridae, and Pomacanthidae (Table 2). The soft-bottom species group guild was the third most diverse, including 57 species from families such as Paralichthyidae, Bothidae, Achiridae, Gerreidae, Ariidae, and Polynemidae. This last group, however, could be underestimated, since deep areas of the bay are dominated

Fig. 2 Number of taxa for six of the sampling methods used in the study; Oyster collectors (13 samplings), Anesthetics (47 samplings), Visual census (13 samplings), Gillnets (15 samplings), Beach seine (12 samplings) and Fisheries (Fish landings) (115 samplings) (see “Materials and methods” for details)



by soft-bottoms that have not been sufficiently sampled (Fig. 1).

Oviparous species that produce pelagic eggs were most numerous, making up 70 % of all species recorded in this study (Fig. 4). This is a high percentage if we consider that of all species known for the TEP, only 56 % belong to this guild (Robertson and Allen 2008). Pelagic spawners are the dominant guild in the marine environment, in richness as well as in abundance (Wootton 1990; Jan 2000). Pelagic eggs have the advantage of dispersion towards the open ocean by currents, decreasing the probability of predation, which is intense in tropical shallow waters (Johannes 1978).

Oviparous species with benthic eggs and a pelagic phase showed the opposite pattern; this group comprises 19.2 % of all species, while in the TEP approximately 30 % of the species have this type of reproduction (Robertson and Allen 2008). The species that belong to this reproductive guild in the region belong to the families Blenniidae, Labrisomidae, Tripterygiidae, Gobiidae, and Gobiesocidae, which are associated to reef systems as well as to coastal and oceanic islands, and have restricted distribution ranges (Hastings 2000; Thomson and Gilligan 2002). Generally, the eggs of fish that spawn on the bottom have less water, more caloric content and are larger than pelagic eggs, although they are less abundant. Under ideal conditions, survival until hatching can be 100 %, which is never seen for pelagic eggs that can be carried by currents towards places where environmental conditions are unfavourable (Growth 2004; Robertson and Allen 2008).

The least represented guild was of oviparous organisms with a vascularized ventral sac, but includes only the Pacific seahorse *Hippocampus ingens* (Syngnathidae); in this species, the female deposits the eggs within the male's vascularized sac, where they remain until hatching. The species releases over 1,500 approximately 0.7-cm-long young (Ortega-Salas and Reyes-Bustamante 2006). Parental care is a breeding

strategy that guarantees protection and high survival rates (Growth 2004).

The dominant trophic preferences were those of opportunistic carnivorous species that feed on benthic invertebrates and fish, and those that feed only on invertebrates (macrobenthivores and microbenthivores) (Fig. 4). This could be a consequence of prey availability. Predators play an important role in population regulation of the species they feed on (Gerking 1994). The most representative macrobenthivores in this ecosystem were *Haemulon flaviguttatum* and *H. maculidaurda*; these species can be found in reef ecosystems as well as over soft bottoms. In order to reduce predation risk during the day, they remain in protected areas, and they move out at night towards sandy bottoms to feed (Hobson 1965). The least represented trophic guild was that of parasites, which included only *Plagiotremus azaleas* (Blenniidae), a species that feeds on the mucus and skin of other fish (Fischer et al. 1995). Parasitism is considered the rarest and most specialized behavior among fish (Lagler et al. 1990).

Of all species recorded, 6.7 % had a circumtropical distribution and 6.8 % were transpacific. A minimum component of the fish fauna has an Indo-Pacific origin, even when they are widely distributed in oceanic islands of the TEP (Palacios-Salgado et al. 2008). The endemic component of the Eastern Pacific had 31.2 % of species distributed from the Cortez to the Panamic province, and 19.3 % distributed from the San Diegan to the Panamic province (Fig. 4). Four species were endemic to the Mexican province: the festive drum (*Pareques fuscovittatus*), the redbottom blenny (*Malacoctenus polyporosus*), the professor blenny (*Paraclinus stephensi*) and the Mexican worm blenny (*Stathmonotus lugubris*). The presence of the flag triplefin (*Enneanectes reticulatus*) and the one-eyed blenny (*Paraclinus monophthalmus*) represent a significant extension of their previously known distribution range. The triplefin flag is an endemic species from the Cortez province, and its range

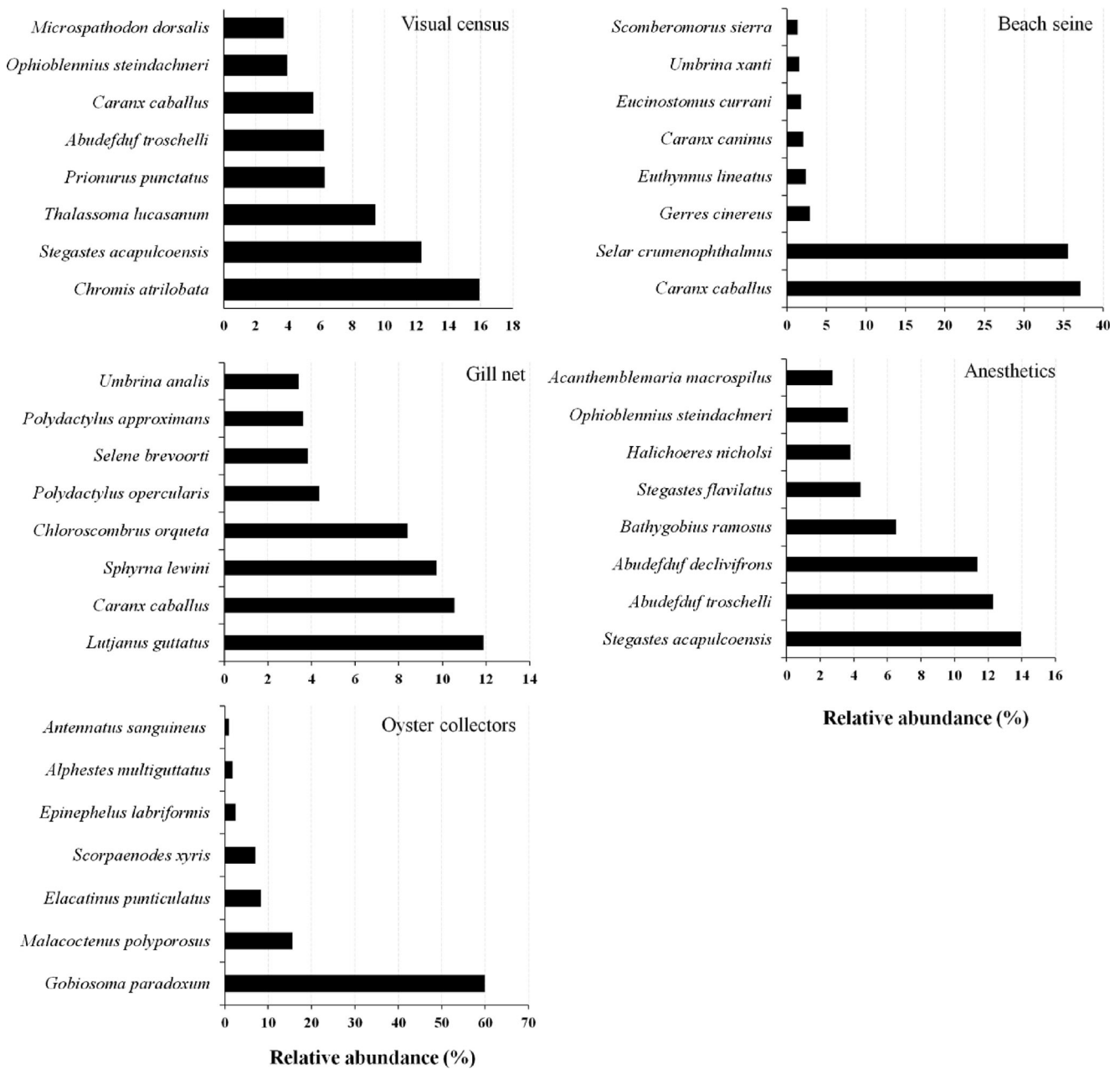


Fig. 3 Relative abundance of the most important species recorded with Visual census (13 samplings), Beach seine (12 samplings), Gillnets (15 samplings), Anesthetics (47 samplings) and Oyster collectors (13 samplings)

increased approximately 1,200 km towards the southern Gulf of California (Thomson et al. 2000). The one-eyed blenny is an endemic species from the Panamic province, and its range increased approximately 1,100 km over its previously known distribution that includes El Salvador to Panama (Robertson and Allen 2008).

The distribution of fish species in Acapulco Bay and in the Eastern Pacific in general has been defined to a great extent by the emergence of the Central American Isthmus, which favored processes of extinction and speciation and gave rise to the present fish associations. This geological process explains

the presence of Circumtropical and Amphi-American species (Rosenblatt 1967; Castro-Aguirre et al. 1995, 2006; Robertson et al. 2004). The extensive distribution ranges of the eurythermal tropical species of the TEP are favored by the longitudinal orientation of the coast, which is relatively simple and straight; by the continental platform, which is continuous and narrow with few oceanic islands; and by the inter-annual variability associated with the El Niño Southern Oscillation, which favors the dispersion of larvae by oceanic currents (Lea and Rosenblatt 2000; Victor et al. 2001; Robertson and Allen 2008). These factors, along with the dominant reproductive

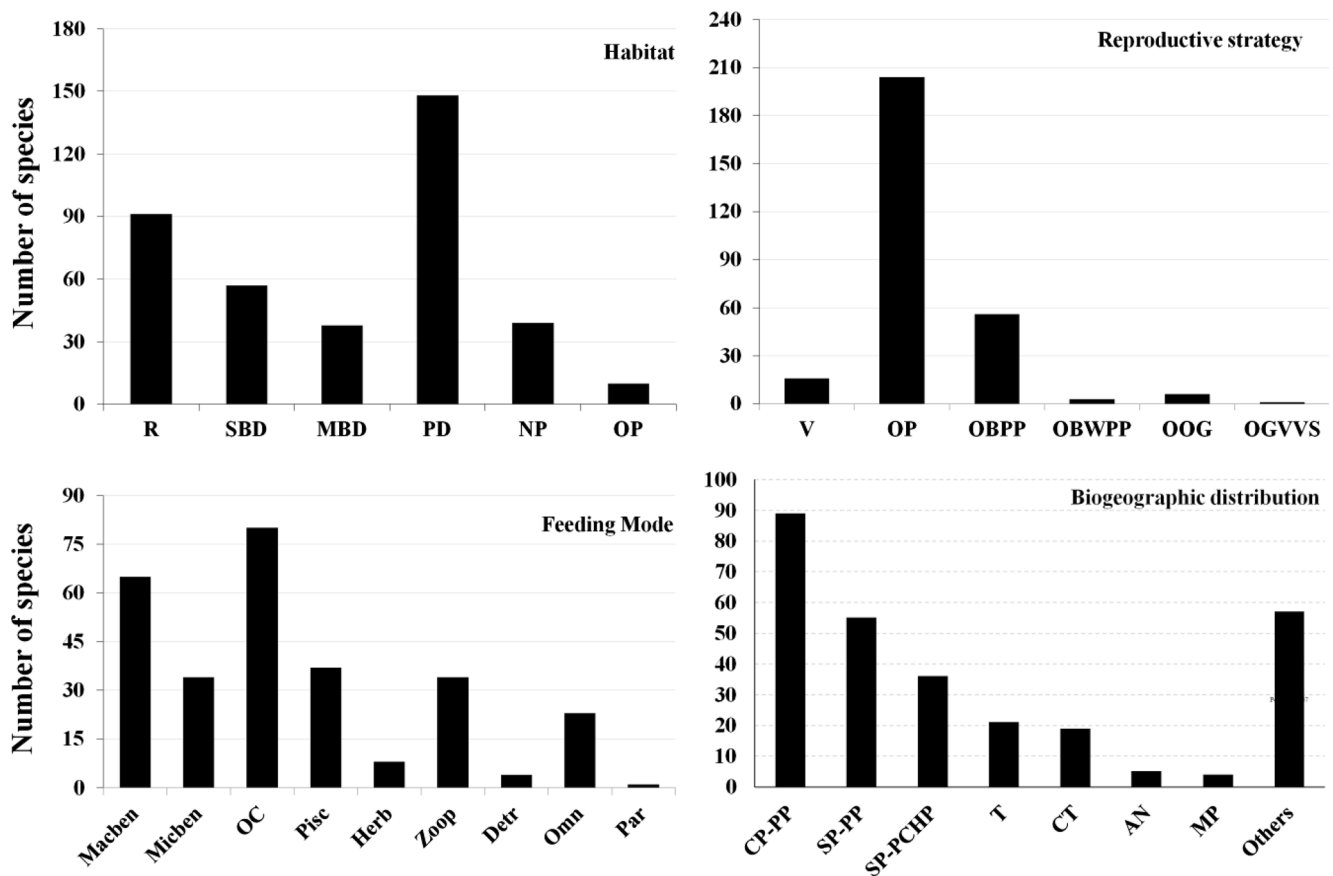


Fig. 4 Habitat preference, reproductive strategies, feeding mode and ichthyogeographic affinity of fish species of Acapulco Bay and its adjacent coastal zone. *R* reef species, *SBD* soft-bottom–demersal, *MBD* mixed-bottom–demersal, *PD* pelagic–demersal, *NP* neritic–pelagic, *OP* oceanic–pelagic; *V* viviparous, *OP* oviparous with pelagic eggs, *OBPP* oviparous with benthic eggs and pelagic phase, *OBWPP* oviparous with benthic eggs without pelagic phase, *OGVVS* oviparous with gestation in

the vascularized ventral sac, *OOG* oviparous with oral gestation; *Macben* macrobenthivores, *Micben* microbenthivores, *OC* opportunistic carnivores, *Pisc* piscivores, *Herb* herbivores, *Zoop* zooplanktivores, *Detr* detritivores, *Omn* omnivores, *Par* parasites; *SP* San Diegan province, *PP* Panamic province, *PCHP* Peruvian–Chilean province, *CP* Cortez province, *CT* Circumtropical, *T* Transpacific, *others* includes remaining combinations

strategy of oviparous pelagic eggs, explain the almost continuous distribution of the majority of the species. The transpacific species group was represented by 21 species, of the 190 known for the TEP (165 are resident and 25 are transient) (Robertson et al. 2004; Robertson and Allen 2008).

In conclusion, the results recorded in this study show the significant fish species richness that characterizes the Acapulco Bay and its adjacent coastal zone. This richness is likely due to the heterogeneity of the ecosystem, which includes rocky substrates and soft-bottom beaches with different oceanographic dynamics, facilitating the presence of a greater variety of species, and of a community with distinct affinities and origins. The fact that this study represents the highest species richness record in the MTP is due to the variety of sampling methods used and the sampling effort, and is also a consequence of the lack of any previous scientific monitoring program that obtained an entire species listings and their spatial-temporal dynamic. Although the assemblage is composed of species with different geographical affinities, most species have an ample distribution

in the Panamic and Cortezian provinces, which shows that the Central American gap has had little effect at the level of regional fauna (Robertson and Cramer 2009). Finally, obtaining a complete and updated taxonomic list represents the baseline of any sustainability and conservation strategy, and thus highlights the importance of this study, and of providing available information about the ichthyodiversity of Acapulco Bay.

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