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ICHTHYODIVERSITY OF SAN JOSE, SAN FRANCISQUITO, AND EL PARDITO ISLANDS IN THE SOUTHWESTERN GULF OF CALIFORNIA, MEXICO

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Background. The San Jose and San Francisquito Islands and El Pardito Islet are important for recreational tourism, sport fishing, and commercial fishing. They are part of an "Area Natural Protegida" and "Area Prioritaria Marina"; however, studies on the composition and diversity of their marine floral and faunal communities are limited. To provide information vital for management and conservation of these islands, a check-list of the ichthyofauna was compiled based on original data and the data extracted from other sources.

Materials and methods. Field methodology involved direct collecting of the specimens using a gill net or a charalera net and/or visual censuses. Records of fish present near the islands were either directly solicited from museum curators of national and international scientific collections or obtained by using online database collections. Additionally, an exhaustive literature search for fish records was carried out, including scientific articles, books, and theses. Finally, the preferential habitat and zoogeographic affinity of fishes were analyzed..

Results. The data yielded 298 species representing 201 genera and assigned to 86 families, 36 orders, and two fish classes. The most numerous families in terms of the species number were Serranidae (23 species), Gobiidae (15 species), and Carangidae (14 species). The most numerous genera were *Lutjanus* and *Halichoeres,* with eight and six species, respectively. On average, there were 3.5 species per family. The fish community was dominated by tropical eurythermal species with wide distribution in the Eastern Pacific. An important component of endemic Cortez Province species was found, represented by 24 species from the families Chaenopsidae, Gobiidae, Labrisomidae, Tripterygiidae, Gobiesocidae, Dactyloscopidae, Kyphosidae, Opistognathidae, and Ophidiidae.

Conclusion. The fish richness of the San Jose and San Francisquito Islands and El Pardito Islet represents 32% of the ichthyofauna recorded for the Gulf of California and includes 24 endemic species.

Keywords: checklist, Cortez Province, endemic species, Serranidae, *Abudefduf troschelii*

INTRODUCTION

The Gulf of California is one of the most diverse regions in the Eastern Tropical Pacific (ETP), having about 911 species, 92 of which are endemic (Thomson et al. 2000, Hastings et al. 2010). This richness has caused the Gulf of California to be considered a place of origin or accumulation of species (Mora and Robertson 2005). Species richness in the Gulf of California is favoured by the topographic and bathymetric complexity that provides a great variety of habitats (Castro-Aguirre et al. 1995, Thomson et al. 2000, Thomson and Gilligan 2002).

The Gulf of California islands have productive environments with high carrying capacities, and are the habitat of a great richness, diversity, and density of fishes (Thomson and Gilligan, 2002). San Jose Island (24°52′12″–25°06′02″N, 110°43′03″–110°31′58″W), San Francisquito Island (24º50′N, 110°35′W) and El Pardito Islet (24°51′10″N, 110°34′52″W) are located north of La Paz Bay, and are separated from the peninsula by the narrow San Jose Channel (Holguin-Quiñones et al. 2008). The El Pardito Islet is permanently inhabited by a family of fishermen, who also carry out biodiversity conservation

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activities on the islet. These islands are in a highly productive fisheries zone; their inputs represent more than 60% of the captures of La Paz Bay (Ramirez-Rodriguez 1997). Commercial catches in this zone undergo important changes at the seasonal, spatial, and fishing gear levels. Specific composition consists of a reduced group of target species and includes several bycatch or occasional species (Montoya-Campos, unpublished*).

These islands also support a great biodiversity of marine macroinvertebrates (Holguin-Quiñones et al. 2008) and mangrove zones (Ramirez-Garcia and Lot 1994) that serve as breeding areas for a wide variety of fish. They are also reproductive areas for several marine bird species (Lozano et al. 2004), and are important for sport fishing as well as tourism and recreational activities such as kayaking. However, despite being part of protected ecological zones, such as the Area Natural Protegida (Anonymous 1978) and Area Prioritaria Marina "Islas del Golfo de California" established by CONABIO (Arriaga et al. 1998), studies on its composition and diversity of marine communities are limited; to date, there are no complete inventories of the fish composition for the area. The majority of the ecosystem ichthyofauna inventories of the Gulf of California have focussed on lagoon systems (e.g., Rodríguez-Romero et al. 1992, Abitia-Cárdenas et al. 1994), and only recently have systematic lists of insular ecosystems been done (Erisman et al. 2011, Del Moral-Flores, unpublished**).

In this context, and aiming to provide better information for accurate management and conservation of resources for these islands, this study presents an integrated systematic list of the ichthyofauna from San Jose and San Francisquito Islands and El Pardito Islet. Additionally, the most abundant species are indicated, the preferential habitat and the species' zoogeographic affinity are analyzed.

MATERIALS AND METHODS

To generate the systematic list of the ichthyofauna from San Jose, San Francisquito, and El Pardito Islands, three information sources were considered: records from field observations, records from both national and international scientific collections, and the scientific literature.

Field methodology consisted of specimen collecting (using a gill net and a charalera net) and of visual censuses. For net sampling, six bimonthly field trips were made from September 2000 to August 2001, and eleven localities were evaluated, eight with gill net and three with charalera net (Fig. 1). The gill net was made of nylon (N.47) monofilament fishing line, and measured 140 m in length by 3 m in width, featuring a 9 cm stretched mesh size. This net was placed obliquely to the shoreline at sunset (1800 h) and recovered the next day in the morning (0600 h). The charalera net was 50 m long and 2 m wide with a 0.5 cm stretched mesh size. Net-captured fish were counted, weighed, measured, and identified in the field using the identification key by Fischer et al. (1995). Two organisms of each doubtful species were fixed in 10% formalin for species corroboration at the Laboratorio de Ecologia de Peces del Centro Interdisciplinario de Ciencias Marinas (CICIMAR) in La Paz, Baja California Sur, Mexico.

Visual censuses were carried out during ten monthly trips to 13 localities dominated by rocky reefs, from March 2001 to August 2002 (except for January and September) (Fig. 1). These censuses were carried out using SCUBA and free diving, swimming parallel to shore along 50 m by 5 m duplicate transects (500 m^2 total per station). At the stations of El Melon, El Faro, El Pardito, El Conejo, and San Francisquito 1, the sampling was done at two depths (1~3 m and 5~7 m). Censuses were made during the day between 1000 h and 1600 h, which is when outdoor lighting for viewing and identifying fish is the best. All fish species and their abundances were recorded on acrylic sheets. In March, May, September, and October 2011, censuses were carried out in three other localities at two depths using the diving methodology outlined above (Fig. 1).

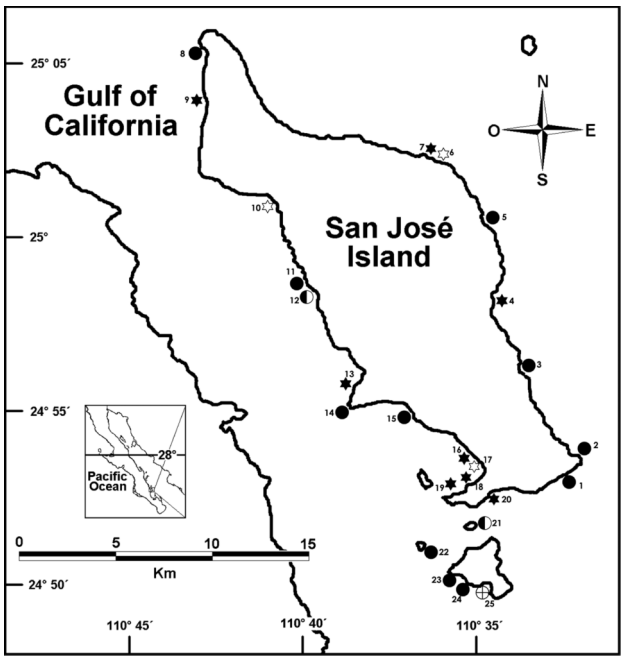

Fig. 1. Evaluated localities from San Jose and San Francisquito Islands, and El Pardito Islet in the southwestern Gulf of California: 1 = El Conejo, 2 = La Estacuda, 3 = El Cordon Negro, 4 = La Cañada, 5 = Punta Colorada 1, 6 = Punta Colorada 2, 7 = Punta Colorada 3, 8 = Piedra Ahogada, 9 = Punta Calabozo, 10 = Punta Cardon, 11 = La Cuevita, 12 = El Melon, 13 = El Muelle, 14 = El Faro 1, 15 = El Faro 2, 16 = Boca Estero, 17 = Boca estero Este, 18 = Boca estero Oeste, 19 = Punta Cantos, 20 = Boca estero Sur, 21 = El Pardito, 22 = El Cayuco, 23 = San Francisquito 1, 24 = San Francisquito 2, 25 = El Cubo del Dandy; Circles represent localities evaluated with visual censuses; black dots—were evaluated during 2001–2002, cross out circles—during 2011, and black-and-white dots—during both periods; black stars represent localities evaluated using a gill net, hollow stars—using a charalera net

* Montoya-Campos M. 2009. Cambios en la composicion especifica de la captura artesanal de escama al sur de la Isla San Jose, Baja California Sur, Mexico. MSc Thesis. CICIMAR-IPN., La Paz, B.C.S. Mexico.

** Del Moral-Flores L.F. 2010. Diversidad y patrones biogeográficos de la ictiofauna asociada a los complejos insulares del Golfo de California. MSc Thesis. CICIMAR-IPN., La Paz, Mexico.

Records of fish from the islands were solicited directly from the museum curators of national and international scientific collections (e.g., MHNUABCS-CI = Museo de Historia Natural de la Universidad Autonoma de Baja California Sur, La Paz), or obtained by using online databases (e.g., http://www.coleccion.cicimar.ipn.mx); information for twelve of these was found (Table 1). Additionally, an exhaustive search for fish records was carried out in the literature, including scientific papers, books, and theses.

We performed an overview of the fish composition of the islands, and the preferential habitats were recorded. According to their habitat, species were classified as follows: reef (A); soft bottom demersal (B); mixed bottom demersal (C); pelagic-demersal (D; meaning: demersal but occasionally migrating into the water columns); neritic-pelagic (E); oceanic-pelagic (F); mesopelagic (G); bathybenthonic (H); and pelagic-benthonic (I). Biological information was obtained from specific published sources (e.g., Thomson et al. 2000, Robertson and Allen 2008).

Additionally, zoogeographic affinity was analyzed according to the basic scheme by Briggs (1974), with modifications by Hastings (2000), Robertson et al. (2004), and Horn et al. (2006). The species were grouped into the following classes, which take their natural distributions into account:

- Province of San Diego (PS): from Point Conception to Bahía Magdalena off the western coast of Baja California Sur, corresponding to warm-temperate waters, in which the temperature rarely drops below 10°C or exceeds 25°C.
- Cortez Province (PC): including the southern part of Bahía Magdalena (lat ~ 25°N) and the central and northern Gulf of California). The water temperature in winter rarely falls below 13–15°C, but in summer it can increase up to 25°C or even 30°C. Along the eastern Gulf coast, the PC is isolated from the Mexican province by the Sinaloa gap, a 370 km band of sandy and muddy coastline extending between Topolobampo and Mazatlan.
- Mexican Province (PM): includes the coast of Mexico from Mazatlan, Sinaloa to the Isthmus of Tehuantepec, Oaxaca. This province is located in the tropic, where water temperatures in winter rarely fall below 18–20°C. It is separated from the PC to the west by a 300 km stretch of open water between Mazatlan and the Peninsula of Baja California, and to the north by the aforementioned Sinaloa gap.
- Panamic Province (PP): extends south from El Salvador to near Cape Blanco in northern Peru. Between this province and the previous, there is an extensive section (the Central America gap) of sandy coastline (1000 km) between the Gulf of Tehuantepec and El Salvador. Along the southern boundary of this province (lat ~ 6°S), there is a transition zone influenced by warm waters from Ecuador and cold coastal waters from the Peruvian Current coming from Chile (Chirichigno and Cornejo 2001). This province also has a tropical environment.
- Peruvian-Chilean Province (PPCH): extends from Sechura Bay to northern Chiloe Island in Chile.
- Circumtropical (CT): are the fish species widely distributed in the tropical seas of the world.
- Transpacific (T): species are distributed on both sides of the barrier of the Pacific, Eastern Tropical Pacific (ETP) and Central and Western Tropical Pacific.
- Amfiamerican (AM): species are distributed on both sides of Central America: ETP and Western Atlantic.

Finally, the systematic arrangement followed criteria proposed by Nelson (2006) with modifications by Wiley and Johnson (2010). Genera and respective species are presented alphabetically. The proper spelling of scientific names and common names follow FishBase (Froese and Pauly 2012).

Table 1

Systematic list of the ichthyofauna from San Jose and San Francisquito Islands, and El Pardito Islet in the southwestern Gulf of California

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
CLASS CHONDRICHTHYES				
FAMILY HETERODONTIDAE				
Heterodontus francisci (Girard, 1855)		SIO	C	SP–CP
Heterodontus mexicanus Taylor et Castro-Aguirre, 1972		LACM	C	CP-PP
FAMILY TRIAKIDAE				
Mustelus henlei (Gill, 1863)		4	D	OP-CP, PP
Mustelus lunulatus Jordan et Gilbert, 1882	b		D	OP-PP
FAMILY CARCHARHINIDAE				
Carcharhinus falciformis (Müller et Henle, 1839)	b		F	CT
Carcharhinus limbatus (Müller et Henle, 1839)	b		F	CT
Nasolamia velox (Gilbert, 1898)		SIO	D	SP-PP
Rhizoprionodon longurio (Jordan et Gilbert, 1882)		CICIMAR-CI	D	SP-PP
FAMILY SPHYRNIDAE				
Sphyrna lewini (Griffith et Smith, 1834)		4	F	CT

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
FAMILY SQUATINIDAE				
Squatina californica Ayres, 1859	a	CICIMAR-CI, 4	C	AP-CP
FAMILY NARCINIDAE				
Diplobatis ommata (Jordan et Gilbert, 1890)	a	CICIMAR-CI, LACM, SIO, SU	C	SP-PP
FAMILY RHINOBATIDAE				
Rhinobatos productus Ayres, 1854		CICIMAR-CI	C	OP-MP
FAMILY UROTRYGONIDAE				
Urobatis concentricus Osburn et Nichols, 1916	a		C	SP-MP
FAMILY UROLOPHIDAE				
Urolophus halleri Cooper, 1863	a	4	C	OP-PP
Urolophus maculatus (Garman, 1913)	a		C	SP-CP
FAMILY DASYATIDAE				
Dasyatis dipterura (Jordan et Gilbert, 1880)	a		C	SP-PCHP
FAMILY MYLIOBATIDAE				
Mobula japanica (Müller et Henle, 1841)		4	F	CT
Mobula munkiana Notarbartolo-di-Sciara, 1987		SIO	F	CP-PP
Mobula thurstoni (Lloyd, 1908)		SIO	E	CT
Myliobatis californica Gill, 1865		4	C	OP-CP
CLASS ACTINOPTERYGII				
FAMILY ELOPIDAE				
Elops affinis Regan, 1909	b		E	SP-PP
FAMILY ALBULIDAE				
Albula esuncula (Garman, 1899)	b		D	CP-PP
FAMILY OPHICHTHIDAE				
Callechelys cliffi Böhlke et Briggs, 1954		SIO	C	CP-PP
Callechelys eristigma McCosker et Rosenblatt, 1972		SIO	C	CP-PP
Ichthyapus selachops (Jordan et Gilbert, 1882)		SIO	B	CP-PP
Myrichthys tigrinus Girard, 1859		LACM, SIO	C	CP-PP
Myrophis vafer Jordan et Gilbert, 1883		SIO	B	SP-PP
Quassiremus nothochir (Gilbert, 1890)		SIO, USNM	A	CP-PP
FAMILY CONGRIDAE				
Bathycongrus macrurus (Gilbert, 1891)		SIO	H	CP-PP
FAMILY NETTASTOMATIDAE				
Facciolella equatorialis (Gilbert, 1891)		SIO	G	SP-PP
FAMILY MURAENIDAE				
Anarchias galapagensis (Seale, 1940)		SIO	A	CP-PP
Echidna nebulosa (Ahl, 1789)	a		A	T
Echidna nocturna (Cope, 1872)		SIO	A	CP-PP
Gymnomuraena zebra (Shaw, 1797)	a		A	T
Gymnothorax castaneus (Jordan et Gilbert, 1883)	a, b	SIO	A	CP-PP
Gymnothorax equatorialis (Hildebrand, 1946)	a		B	SP-PP
Gymnothorax panamensis (Steindachner, 1876)		CAS, LACM, SIO	A	CP-PP
Muraena lentiginosa Jenyns, 1842	a	LACM, SIO, USNM	A	CP-PP
Uropterygius polystictus Myers et Wade, 1941		SIO	A	CP, PP
FAMILY ENGRAULIDAE				
Anchoa exigua (Jordan et Gilbert, 1882)		MCZ, USNM	E	SP-PP
Anchoa ischana (Jordan et Gilbert, 1882)		YPM	E	CP-PP
FAMILY DUSSUMIERIIDAE				
Etrumeus teres (DeKay, 1842)		SIO	E	CT
FAMILY CLUPEIDAE				
Harengula thrissina (Jordan et Gilbert, 1882)	a, c	YPM	E	CP-PCHP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Opisthonema libertate (Günther, 1867)	c		E	SP-PP
Opisthonema medirastre Berry et Barrett, 1963	c		E	OP-PP
Sardinops sagax (Jenyns, 1842)		SIO	E	AP-CP
FAMILY CHANIDAE				
Chanos chanos (Forsskål, 1775)	b	IBUNAM	E	T
FAMILY ARIIDAE				
Bagre panamensis (Gill, 1863)		4	B	SP-PP
Occidentarius platypogon (Günther, 1864)	b	IBUNAM	B	SP-PP
FAMILY ARGENTINIDAE				
Argentina sialis Gilbert, 1890		SIO	B	OP-CP
FAMILY AULOPIDAE				
Aulopus bajacali Parin et Kotlyar, 1984		SIO	B	SP-CP
FAMILY SYNODONTIDAE				
Synodus evermanni Jordan et Bollman, 1890		SIO	B	SP-PP
Synodus lacertinus Gilbert, 1890		LACM, SIO	C	CP-PCHP
Synodus scituliceps Jordan et Gilbert, 1882		SIO, YPM	B	SP-PCHP
FAMILY MYCTOPHIDAE				
Benthosema panamense (Tåning, 1932)		SIO	G	SP-PP
FAMILY HOLOCENTRIDAE				
Myripristis leiognathus Valenciennes, 1846	a, b	CAS, LACM, SIO	A	SP-PP
Sargocentron suborbitalis (Gill, 1863)	a, b, c	CICIMAR-CI, LACM, SIO, 1	A	CP-PP
FAMILY MUGILIDAE				
Mugil cephalus Linnaeus, 1758	a, b, c	IBUNAM, SIO, 4	D	CT
Mugil curema Valenciennes, 1836	a	AMNH, IBUNAM	D	CT
FAMILY SYNGNATHIDAE				
Doryrhamphus excisus Kaup, 1856		CAS, CICIMAR-CI, SIO,	A	T
FAMILY AULOSTOMIDAE				
Aulostomus chinensis (Linnaeus, 1766)	a		A	T
FAMILY FISTULARIIDAE				
Fistularia commersonii Rüppell, 1838	a, c	AMNH, IBUNAM, SIO	A	CT
Fistularia corneta Gilbert et Starks, 1904		LACM	D	OP-PCHP
FAMILY ATHERINOPSIDAE				
Atherinops affinis (Ayres, 1860)	c		E	AP-CP
FAMILY BELONIDAE				
Ablennes hians (Valenciennes, 1846)	a, b	LACM, SIO	F	CT
Platybelone argalus (Lesueur, 1821)		SIO	E	CT
Strongylura exilis (Girard, 1854)		LACM, SIO, 1	E	OP-PP
Tylosurus pacificus (Steindachner, 1876)	a, b, c	SIO	F	SP-PP
FAMILY EXOCOETIDAE				
Fodiator acutus (Valenciennes, 1847)		SIO	E	SP-PCHP
FAMILY HEMIRAMPHIDAE				
Hemiramphus saltator Gilbert et Starks, 1904	a, c	LACM	E	CP-PP
Hyporhamphus naos Banford et Collette, 2001	a	LACM, SIO, USNM	E	SP-PP
FAMILY ZANCLIDAE				
Zanclus cornutus (Linnaeus, 1758)	a		A	T
FAMILY ACANTHURIDAE				
Acanthurus nigricans (Linnaeus, 1758)	a		A	T
Acanthurus triostegus (Linnaeus, 1758)	a		A	T
Acanthurus xanthopterus Valenciennes, 1835	a	1	A	T
Prionurus punctatus Gill, 1862	a	1	A	CP-PP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
FAMILY BATRACHOIDIDAE				
Porichthys analis Hubbs et Schultz, 1939		SIO	B	CP-MP
FAMILY TRIPTERYGIIDAE				
Enneanectes carminalis (Jordan et Gilbert, 1882)		LACM, SIO	A	SP-PP
Axoclinus lucillae Fowler, 1944			A	MP-PP
Axoclinus nigricaudus Allen et Robertson, 1991		SIO	A	CP
Axoclinus sp.	a		A	
Crocodilichthys gracilis Allen et Robertson, 1991		SIO, USNM, 1	A	CP
Enneanectes reticulatus Allen et Robertson, 1991		IBUNAM, SIO	A	SP-CP
FAMILY DACTYLOSCOPIDAE				
Dactylagnus mundus Gill, 1863		IBUNAM, SIO, USNM	B	SP-PP
Dactyloscopus lunaticus Gilbert, 1890		AMNH	B	CP-PP
Dactyloscopus pectoralis Gill, 1861	c	SIO	B	CP
Gillellus semicinctus Gilbert, 1890		LACM	B	SP-PP
FAMILY BLENNIIDAE				
Hypsoblennius brevipinnis (Günther, 1861)		SIO	A	SP-PP
Hypsoblennius gentilis (Girard, 1854)		SIO	A	OP-CP
Ophioblennius steindachneri Jordan et Evermann, 1898	a	CICIMAR-CI, IBUNAM, LACM, SIO, 1	A	SP-PP
Plagiotremus azaleus (Jordan et Bollman, 1890)		CAS, SIO	A	SP-PP
FAMILY CHAENOPSIDAE				
Acanthemblemaria crockeri Beebe et Tee-Van, 1938		CAS, IBUNAM, SIO	A	CP
Acanthemblemaria hastingsi Lin et Galland, 2010		SIO	A	CP
Chaenopsis alepidota (Gilbert, 1890)	c	ANSP, IBUNAM, SIO, SU	A	SP-CP
Cirriemblemaria lucasana (Stephens, 1963)		SIO	A	CP-MP
Coralliozetus angelicus (Böhlke et Mead, 1957)		IBUNAM, SIO	A	CP-MP
Coralliozetus micropes (Beebe et Tee-Van, 1938)		SIO	A	CP
Coralliozetus rosenblatti Stephens, 1963		SIO	A	CP
Emblemaria hypacanthus (Jenkins et Evermann, 1889)		AMNH, IBUNAM, SIO	A	CP
Emblemaria walkeri Stephens, 1963		IBUNAM	A	CP
Protemblemaria bicirrus (Hildebrand, 1946)		SIO	A	CP-PP
Stathmonotus sinuscalifornici (Chabanaud, 1942)		SIO	A	CP
FAMILY LABRISOMIDAE				
Labrisomus striatus Hubbs, 1953		SIO	A	CP-MP
Labrisomus xanti Gill, 1860	a	LACM, SIO	A	SP-MP
Malacoctenus hubbsi Springer, 1959		IBUNAM, LACM, SIO	A	CP
Malacoctenus mexicanus Springer, 1959		LACM, SIO	A	CP-MP
Malacoctenus tetranemus (Cope, 1877)		LACM, SIO	A	CP-PP
Paraclinus sini Hubbs, 1952		IBUNAM, SIO	A	SP-CP
Starksia cremnobates (Gilbert, 1890)		SIO	A	CP
Starksia spinipenis (Al-Uthman, 1960)		SIO	A	CP-MP
Xenomedea rhodopyga Rosenblatt et Taylor, 1971		SIO,	A	CP
FAMILY NEMATISTIIDAE				
Nematistius pectoralis Gill, 1862	b	AMNH	E	SP-PP
FAMILY CORYPHAENIDAE				
Coryphaena hippurus Linnaeus, 1758	a		F	CT
FAMILY CARANGIDAE				
Caranx caballus Günther, 1868	a, b	CICIMAR-CI	E	OP-PCHP
Caranx caninus Günther, 1867	a, b, c		E	SP-PCHP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Caranx sexfasciatus Quoy et Gaimard, 1825	a, b		E	T
Decapterus macarellus (Cuvier, 1833)	a, b		F	CT
Elagatis bipinnulata (Quoy et Gaimard, 1825)		CICIMAR-CI	F	CT
Gnathanodon speciosus (Forsskål, 1775)	a		E	T
Naucrates ductor (Linnaeus, 1758)	a		F	CT
Selar crumenophthalmus (Bloch, 1793)		MCZ	E	CT
Selene brevoortii (Gill, 1863)	b		D	SP-PCHP
Selene peruviana (Guichenot, 1866)	a		D	SP-PCHP
Seriola lalandi Valenciennes, 1833	a		D	CT
Seriola peruana Steindachner, 1881		3	D	CP-PP
Seriola rivoliana Valenciennes, 1833	a		D	CT
Trachinotus rhodopus Gill, 1863	a, b, c		D	SP-PCHP
FAMILY GOBIESOCIDAE				
Arcos erythrops (Jordan et Gilbert, 1882)		LACM	A	CP-MP
Tomicodon boehlkei Briggs, 1955		IBUNAM, LACM	A	CP
Tomicodon humeralis (Gilbert, 1890)		IBUNAM	A	CP
Tomicodon myersi Briggs, 1955		SIO	A	CP-PP
FAMILY GOBIIDAE				
Aruma histrio (Jordan, 1884)		SIO	A	CP
Barbulifer pantherinus (Pellegrin, 1901)		SIO	A	CP
Bathygobius ramosus Ginsburg, 1947		IBUNAM	A	CP-PP
Chriolepis cuneata Bussing, 1990		SIO	A	CP-PP
Chriolepis zebra Ginsburg, 1938		SIO	C	CP
Coryphopterus urospilus Ginsburg, 1938		LACM, SIO, 1	C	CP-PP
Ctenogobius sagittula (Günther, 1862)	c		B	SP-PP
Elacatinus limbaughi Hoese et Reader, 2001		SIO	A	CP
Elacatinus punticulatus (Ginsburg, 1938)	a	SIO, 1	A	CP-PP
Gobiosoma chiquita (Jenkins et Evermann, 1889)	c	IBUNAM, SIO	C	CP
Gymneleotris seminuda (Günther, 1864)		SIO	A	CP-PP
Lythrypnus dalli (Gilbert, 1890)		LACM, SIO, SU, 1	A	SP-PP
Lythrypnus pulchellus Ginsburg, 1938		SIO	A	CP-PP
Pycnomma semisquamatum Rutter, 1904		SIO	A	CP
Quietula y-cauda (Jenkins et Evermann, 1889)		SU	B	OP-CP
FAMILY LABRIDAE				
Bodianus diplotaenia (Gill, 1862)	a	SIO, 1	A	SP-PCHP
Decodon melasma Gomon, 1974		SIO	C	SP-PP
Halichoeres chierchiae Di Caporiacco, 1948	a	1	A	CP-PP
Halichoeres dispilus (Günther, 1864)	a	SIO, 1	A	SP-PP
Halichoeres melanotis (Gilbert, 1890)	a		A	SP-PP
Halichoeres nicholsi (Jordan et Gilbert, 1882)	a	1	A	CP-PP
Halichoeres notospilus (Günther, 1864)	a		A	CP-PP
Halichoeres semicinctus (Ayres, 1859)	a		A	SP-CP
Iniistius pavo (Valenciennes, 1840)		1	A	T
Novaculichthys taeniourus (Lacepède, 1801)	a		A	T
Thalassoma grammaticum Gilbert, 1890	a		A	CP-PP
Thalassoma lucasanum (Gill, 1862)	a, c	BPBM, CAS, LACM, SIO, YPM, 1	A	SP-PP
FAMILY SCARIDAE				
Nicholsina denticulata (Evermann et Radcliffe, 1917)	a, b	LACM, SIO	A	SP-PP
Scarus compressus (Osburn et Nichols, 1916)	a, b	1	A	CP-PP
Scarus ghobban Forsskål, 1775	a, b	AMNH, SIO, 4, 1	A	T
Scarus perrico Jordan et Gilbert, 1882	a	AMNH, 1	A	CP-PP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Scarus rubroviolaceus Bleeker, 1847	a, b	1	A	T
FAMILY POMACENTRIDAE				
Abudefduf declivifrons (Gill, 1862)	a		A	CP-PP
Abudefduf troschelii (Gill, 1862)	a, b, c	IBUNAM, LACM, SIO, 1	A	SP-PP
Chromis atrilobata Gill, 1862	a	CAS, LACM, SIO, 1	A	SP-PCHP
Chromis limbaughi Greenfield et Woods, 1980		SIO	A	CP-MP
Microspathodon bairdii (Gill, 1862)	a		A	CP-PP
Microspathodon dorsalis (Gill, 1862)	a	AMNH, LACM, SIO, 1	A	CP-PP
Stegastes acapulcoensis (Fowler, 1944)	a		A	CP-PP
Stegastes flavilatus (Gill, 1862)	a	1	A	SP-PP
Stegastes leucorus (Gilbert, 1892)	a		A	SP-MP
Stegastes rectifraenum (Gill, 1862)	a	AMNH, CAS, LACM, SIO, 1	A	SP-MP
FAMILY LOPHIIDAE				
Lophiodes spilurus (Garman, 1899)		SIO	B	OP-PP
FAMILY ANTENNARIIDAE				
Fowlerichthys avalonis (Jordan et Starks, 1907)		SIO	C	SP-PCHP
Antennatus sanguineus (Gill, 1863)		SIO	A	CP-PP
Antennatus strigatus (Gill, 1863)		SIO	A	CP-PP
FAMILY CARAPODIDAE				
Echiodon exsilium Rosenblatt, 1961		SIO	C	CP-PP
Carapus dubius (Putnam, 1874)		CAS	C	CP-PP
FAMILY OPHIDIIDAE				
Cherublemma emmelas (Gilbert, 1890)		UMMZ	B	CP-PCHP
Lepophidium microlepis (Gilbert, 1890)		SIO	B	CP, PP
Neobythites stelliferoides Gilbert, 1890		SIO	B	CP-PP
Ophidion iris Breder, 1936		SIO	B	CP
Otophidium indefatigabile Jordan et Bollman, 1890		SIO	B	CP-PP
FAMILY BYTHITIDAE				
Grammonus diagrammus (Heller et Snodgrass, 1903)		CAS, SIO	A	SP-PP
FAMILY OPISTOGNATHIDAE				
Opistognathus brochus Bussing et Lavenberg, 2003		SIO	C	CP, PP
Opistognathus fossoris Bussing et Lavenberg, 2003		SIO	C	CP
Opistognathus punctatus Peters, 1869	a	CICIMAR-CI, SIO	C	SP-PP
Opistognathus rhomaleus Jordan et Gilbert, 1881		LACM, SIO	C	SP-PP
Opistognathus rosenblatti Allen et Robertson, 1991		SIO	C	SP-CP
FAMILY APOGONIDAE				
Apogon pacificus (Herre, 1935)	a	1	A	SP-PCHP
Apogon retrosella (Gill, 1862)	a	AMNH, LACM, SIO, SU, 1	A	SP-PP
FAMILY MALACANTHIDAE				
Caulolatilus affinis Gill, 1865		SIO	D	SP-PCHP
FAMILY LUTJANIDAE				
Hoplopagrus guentherii Gill, 1862	a, b, c	AMNH, SIO, 4	D	SP-PP
Lutjanus aratus (Günther, 1864)	a, b		D	CP-PP
Lutjanus argentiventris (Peters, 1869)	a, b, c	IBUNAM, SIO, 4, 1	D	SP-PCHP
Lutjanus colorado Jordan et Gilbert, 1882	a		D	SP-PP
Lutjanus guttatus (Steindachner, 1869)	b		D	CP-PCHP
Lutjanus jordani (Gilbert, 1898)		YPM	D	SP-PP
Lutjanus novemfasciatus Gill, 1862	a, b	AMNH, IBUNAM, SIO	D	SP-PP
Lutjanus peru (Nichols et Murphy, 1922)	a		D	SP-PCHP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Lutjanus viridis (Valenciennes, 1846)	a		A	CP-PP
FAMILY GERREIDAE				
Eucinostomus currani Zahuranec, 1980	a, c		B	SP-PCHP
Eucinostomus dowii (Gill, 1863)	b, c	IBUNAM, SIO, USNM	B	SP-PP
Eucinostomus entomelas Zahuranec, 1980	c	SIO	B	SP-PP
Eucinostomus gracilis (Gill, 1862)	c		B	SP-PP
Gerres cinereus (Walbaum, 1792)	a, b, c	CICIMAR-CI, SIO, 4	B	AM
FAMILY HAEMULIDAE				
Anisotremus interruptus (Gill, 1862)	a, b, c	AMNH, IBUNAM, SIO	D	SP-PP
Anisotremus taeniatus Gill, 1861	a		A	CP-PP
Haemulon flaviguttatum Gill, 1862	a, b	IBUNAM, SIO	D	SP-PP
Haemulon maculicauda (Gill, 1862)	a, b	SIO	D	CP-PP
Haemulon scudderii Gill, 1862	a, b	CICIMAR-CI	D	CP-PP
Haemulon sexfasciatum Gill, 1862	a, b	AMNH, CICIMAR-CI, IBUNAM, SIO, 4, 1	D	CP-PP
Haemulon steindachneri (Jordan et Gilbert, 1882)	a, b	SIO	D	AM
Microlepidotus inornatus Gill, 1862	a, b	IBUNAM, LACM, SIO	D	SP-MP
Orthopristis chalceus (Günther, 1864)	b, c		D	SP-PCHP
Pomadasys panamensis (Steindachner, 1876)	b		D	CP-PP
Xenichthys xanti Gill, 1863	a		D	CP-PCHP
Xenistius californiensis (Steindachner, 1876)		SIO	D	OP-PP
FAMILY SPARIDAE				
Calamus brachysomus (Lockington, 1880)	a		C	SP-PCHP
FAMILY POLYNEMIDAE				
Polydactylus approximans (Lay et Bennett, 1839)	c		B	OP-PCHP
FAMILY SCIAENIDAE				
Pareques viola (Gilbert, 1898)	a	AMNH, LACM, SIO	A	CP, PP
Umbrina analis Günther, 1868	c		D	CP-PP
Umbrina xanti Gill, 1862		IBUNAM	B	CP-PCHP
FAMILY MULLIDAE				
Mulloidichthys dentatus (Gill, 1862)	a, b	AMNH, CICIMAR-CI, IBUNAM, SIO, 4, 1	C	CP-PP
Pseudupeneus grandisquamis (Gill, 1863)		IBUNAM	B	SP-PCHP
FAMILY KYPHOSIDAE				
Girella simplicidens Osburn et Nichols, 1916	a	SIO	A	CP
Kyphosus analogus (Gill, 1862)	a, b	AMNH, IBUNAM, SIO, 4	A	SP-PP
Kyphosus elegans (Peters, 1869)	a, b	1	A	CP-PP
FAMILY EPHIPPIDAE				
Chaetodipterus zonatus (Girard, 1858)	a		D	SP-PP
FAMILY CHAETODONTIDAE				
Chaetodon humeralis Günther, 1860	a	CICIMAR-CI	C	SP-PCHP
Johnrandallia nigrirostris (Gill, 1862)	a	SIO, 1	A	CP-PCHP
FAMILY POMACANTHIDAE				
Holacanthus clarionensis Gilbert, 1891	a		A	SP-CP
Holacanthus passer Valenciennes, 1846	a	CICIMAR-CI, IBUNAM, SIO, 1	A	SP-PP
Pomacanthus zonipectus (Gill, 1862)	a	IBUNAM, SIO, 1	A	SP-PP
FAMILY CIRRHIRIDAE				
Cirrhitichthys oxycephalus (Bleeker, 1855)	a	BPBM, CAS, LACM, SIO, 1	A	T

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Cirrhitus rivulatus Valenciennes, 1846	a	IBUNAM, LACM, SIO, 1	A	CP-PP
Oxycirrhites typus Bleeker, 1857		CAS	A	T
FAMILY BOTHIDAE				
Bothus leopardinus (Günther, 1862)		YPM	B	SP-PP
Perissias taeniopterus (Gilbert, 1890)		SIO, SU	C	SP-PP
FAMILY PARALICHTHYIDAE				
Citharichthys gilberti Jenkins et Evermann, 1889	c		B	SP-PP
Etropus crossotus Jordan et Gilbert, 1882	c		B	AM
Hippoglossina bollmani Gilbert, 1890		SIO	B	SP-PP
Syacium latifrons (Jordan et Gilbert, 1882)		SIO	B	CP-PP
Syacium ovale (Günther, 1864)		SU	B	CP-PP
FAMILY CYNOGLOSSIDAE				
Symphurus atricaudus (Jordan et Gilbert, 1880)		SU	B	OP-PP
FAMILY SPHYRAENIDAE				
Sphyraena lucasana Gill, 1863	a, b	SIO, 1	E	SP-MP
FAMILY TRICHIURIDAE				
Lepidopus fitchi Rosenblatt et Wilson, 1987		SIO	I	OP-PP
FAMILY SCOMBRIDAE				
Auxis rochei (Risso, 1810)	b		F	CT
Auxis thazard eurydorax (Lacepède, 1800)	b		E	CT
Euthynnus lineatus Kishinouye, 1920	a, b	SIO	F	SP-PP
Scomber japonicus Houttuyn, 1782	b	SIO, 4	E	T
Scomberomorus sierra Jordan et Starks, 1895	a, b		E	SP-PCHP
Thunnus albacares (Bonnaterre, 1788)	a		F	CT
FAMILY SCORPAENIDAE				
Pontinus sierra (Gilbert, 1890)		SIO	B	CP-PP
Scorpaena histrio Jenyns, 1840	b	SIO	C	SP-PCHP
Scorpaena mystes Jordan et Starks, 1895	a, b, c	IBUNAM, LACM, SIO, SU	C	SP-PCHP
Scorpaena sonorae Jenkins et Evermann, 1889		SIO	B	CP-MP
Scorpaenodes xyris (Jordan et Gilbert, 1882)		LACM, SIO	A	SP-PP
FAMILY TRIGLIDAE				
Bellator loxias (Jordan, 1897)		SIO	B	CP-PCHP
Prionotus albirostris Jordan et Bollman, 1890		SIO	B	SP-PP
FAMILY SERRANIDAE				
Diplectrum labarum Rosenblatt et Johnson, 1974		SIO	B	SP-PP
Diplectrum pacificum Meek et Hildebrand, 1925	a		B	SP-PP
Diplectrum rostrum Bortone, 1974		SIO	B	SP-PP
Paralabrax auroguttatus Walford, 1936		SIO	A	SP-MP
Paralabrax maculatofasciatus (Steindachner, 1868)	a, b	CICIMAR-CI, IBUNAM	D	OP-MP
Serranus aequidens Gilbert, 1890		SIO	B	SP-PP
Serranus psittacinus Valenciennes, 1846	a	LACM, SIO, SU	A	SP-PCHP
Hemanthias signifer (Garman, 1899)		CICIMAR-CI	D	SP-PP
Pronotogrammus eos Gilbert, 1890		SIO	D	CP-PP
Alphestes immaculatus Breder, 1936	a, b	SIO	C	CP-PP
Alphestes multiguttatus (Günther, 1867)	a, b		C	CP-PP
Cephalopholis colonus (Valenciennes, 1846)	a, b	LACM, SIO, 4, 1	A	SP-PP
Cephalopholis panamensis (Steindachner, 1877)	a	LACM, SIO, 1	A	CP-PP
Dermatolepis dermatolepis (Boulenger, 1895)		SIO	A	SP-PP
Epinephelus analogus Gill, 1863	a		C	SP-PCHP
Epinephelus labriformis (Jenyns, 1840)	a	LACM, SIO, SU, 1	A	SP-PP

Table 1 (cont.)

Species	Field records	Record code	Habitat	Ichthyogeographic affinities
Epinephelus labriformis (Jenyns, 1840)	a	LACM, SIO, SU, 1	A	SP-PP
Hyporthodus acanthistius (Gilbert, 1892)		CAS	C	SP-PP
Mycteroperca jordani (Jenkins et Evermann, 1889)	a		A	SP-CP
Mycteroperca prionura Rosenblatt et Zahuranec, 1967		SIO	A	CP-MP
Mycteroperca rosacea (Streets, 1877)	a, b	AMNH, CAS, LACM, SIO, 1	A	SP-MP
Pseudogramma thaumasia (Gilbert, 1900)		SIO	A	CP-PP
Rypticus bicolor Valenciennes, 1846	a	CAS, LACM, SIO	A	CP-PP
Rypticus nigripinnis Gill, 1861	a	SIO	C	CP-PP
FAMILY STROMATEIDAE				
Peprilus medius (Peters, 1869)		CICIMAR-CI	E	CP-PCHP
FAMILY BALISTIDAE				
Balistes polylepis Steindachner, 1876	a, b	IBUNAM, 4	D	AP-PCHP
Pseudobalistes naufragium (Jordan et Starks, 1895)	a	1	D	CP-PCHP
Sufflamen verres (Gilbert et Starks, 1904)	a	AMNH, IBUNAM, LACM, SIO, 1	A	SP-PP
FAMILY OSTRACIIDAE				
Ostracion meleagris Shaw, 1796	a		A	T
FAMILY TETRAODONTIDAE				
Arothron hispidus (Linnaeus, 1758)		IBUNAM	A	T
Arothron meleagris (Anonymous, 1798)	a, c	YPM	A	T
Canthigaster punctatissima (Günther, 1870)	a	CAS, LACM, SIO, YPM, 1	A	CP-PP
Sphoeroides annulatus (Jenyns, 1842)	a	IBUNAM, SIO	C	SP-PCHP
Sphoeroides lobatus (Steindachner, 1870)	a	SU	C	SP-PCHP
FAMILY DIODONTIDAE				
Chilomycterus reticulatus (Linnaeus, 1758)	a		C	CT
Diodon holocanthus Linnaeus, 1758	a, b, c	IBUNAM, SIO, 1	C	CT
Diodon hystrix Linnaeus, 1758	a	AMNH	C	CT
FAMILY URANOSCOPIDAE				
Kathetostoma averruncus Jordan et Bollman, 1890		SIO	B	OP-PP

Field records: a = visual census, b = gill net, c = charalera net; Collections records: AMNH = American Museum of Natural History, ANSP = Academy of Natural Sciences of Philadelphia, CAS = California Academy of Sciences; CICIMAR-CI = Centro Interdisciplinario de Ciencias Marinas del Instituto Politecnico Nacional, IBUNAM = Instituto de Biologia de la Universidad Nacional Autonoma de Mexico, LACM = Natural History Museum of Los Angeles County, MCZ = Museum of Comparative Zoology Harvard University, SIO = Scripps Institution of Oceanography, SU = Stanford University, MHNUABCS-CI = Universidad Autonoma de Baja California Sur, UMMZ = Museum of Zoology University of Michigan, USNM = National Museum of Natural History, Smithsonian Institution, YPM = Peabody Museum of Yale University; Literature records: 1 = Sanchez-Ortiz et al. (1997), 2 = Gonzalez-Cabello (unpublished*), 3 = Tavera et al. (2005), 4 = Montoya-Campos (unpublished*); Habitat: A = reef species, B = soft bottom demersal, C = mixed bottom demersal, D = pelagic-demersal, E = neritic-pelagic, F = oceanic-pelagic, G = mesopelagic, H = bathybenthonic, I = pelagic-benthonic; Ichthyogeographic affinity: AP = Aleutian Province, OP = Oregonian Province, SP = San Diego Province, CP = Cortez Province, MP = Mexican Province, PP = Panamic Province, CT = Circumtropical, T = transpacific species; AM = Amphiamerican species, PCHP: Peruvian-Chilean Province.

RESULTS

Based on field sampling, records from national and international online ichthyologic collections, and the scientific literature, a systematic fish check-list from San Jose and San Francisquito islands and El Pardito Islet was integrated, including 298 species representing 201 genera and assigned to 86 families, 36 orders, and two fish classes (Table 1). The families best represented in terms of the species number were the Serranidae (23 species), Gobiidae (15 species), and Carangidae (14 species). A total of 34 families were represented by only one species. On average, there were 3.5 species per family. The most numerous genera were *Lutjanus* and *Halichoeres* with eight and six species, respectively.

The highest number of records was obtained from national and international scientific collections (212 species or 70.8%); field sampling yielded 160 species records (53.7%); and bibliographic sources yielded only

58 species records (19.5%). Of the 160 species recorded during field sampling, 130 (43.6%) were recorded during visual censuses, 59 (19.8%) species were caught in the gill net while 33 (11.1%) were caught in the charalera net. The most abundant species detected by visual census (Fig. 2a) were *Abudefduf troschelii*[*] (25.4%), *Thalassoma lucasanum* (13%), and *Stegastes rectifraenum* (9.5%). The fish most abundant in the gill-net catches (Fig. 2b) were *Microlepidotus inornatus* (16%), *Mulloidichthys dentatus* (11.4%), and *Caranx caballus* (9.33%), while for the charalera net (Fig. 2c) the dominant species were *Harengula thrissina* (64.4%) and *Eucinostomus dowii* (11.13%).

Fishes associated with rocky and coral reef systems were the best represented, by 124 species. Species associated with soft bottoms, mixed bottoms, and pelagic-demersal were similarly represented, by 46, 42, and 41 species, respectively (Fig. 3). In general, the fish community was dominated by a wide distribution of eurythermal tropical species of the Eastern Tropical Pacific region (22.6%: 68 spp.; Cortez Province~Panamic Province), and by species whose distribution range reaches the San Diego Province (22.2%: 66 spp.) surpassing the northern limit of the ETP region (Fig. 4). Of the total recorded taxonomical composition, 24 species (8.1%) were endemic to the Cortez Province. The circumtropical component was represented by 24 species (8.1%) and the Transpacific species group was made up of 21 species (11.1%).

DISCUSSION

The fish composition of San Jose and San Francisquito islands, and El Pardito Islet highlights the importance of these ecosystems as habitat for fish. A total of 298 species were recorded, which represent 48.2% of the total ichthyofauna (618 species) recorded for the Islands of the Gulf of California (Del Moral-Flores, unpublished[**]), 32.7% of the total ichthyofauna (911 species) recorded for all habitats in the Gulf of California (Hastings et al. 2010), and 23.2% of all coastal species (1285 species) known for the Eastern Tropical Pacific (Robertson and Allen 2008).

The species richness of these islands is equivalent to that of the Islas Marías archipelago in the southeastern Gulf of California, for which 318 species are known (Erisman et al. 2011), and slightly above the 228 species known for the Islas Revillagigedos (Castro-Aguirre and Balart 2002). The variety of methods employed in the evaluation of the island's ichthyofauna allowed us to elaborate a highly representative systematic list. Of the dominant species found, the only ones taken by local fishermen and as fresh bait for fisheries are the Mexican goatfish *Mulloidichthys dentatus* and the wavyline grunt, *Microlepidotus inornatus* (see Montoya-Campos, unpublished[**]).

Records obtained from bibliographic sources yielded only 58 species. This last result reflects the limited amount of research being carried out on these islands, even though they are important for fish biodiversity. Records from scientific collections yielded 212 species, a little over 70% of all recorded species. Museums are an invaluable source of information, product of the efforts of numerous researchers and a great quantity of evaluations carried out in several locations, with diverse methods and during different time periods (Chávez-Ramos et al. 1994, Del Moral-Flores, unpublished[**]). Including those records increased significantly the species richness of this systematic list, which is dominated by species associated with shallow rocky and coral reef systems (41.6% of species).

The families with the greatest species richness in this study were Serranidae (23 spp.), Gobiidae (15 spp.), and Carangidae (14 spp.). However, those families only corresponded to 41%, 13%, and 40%, respectively, of the known species in the Eastern Tropical Pacific (Robertson

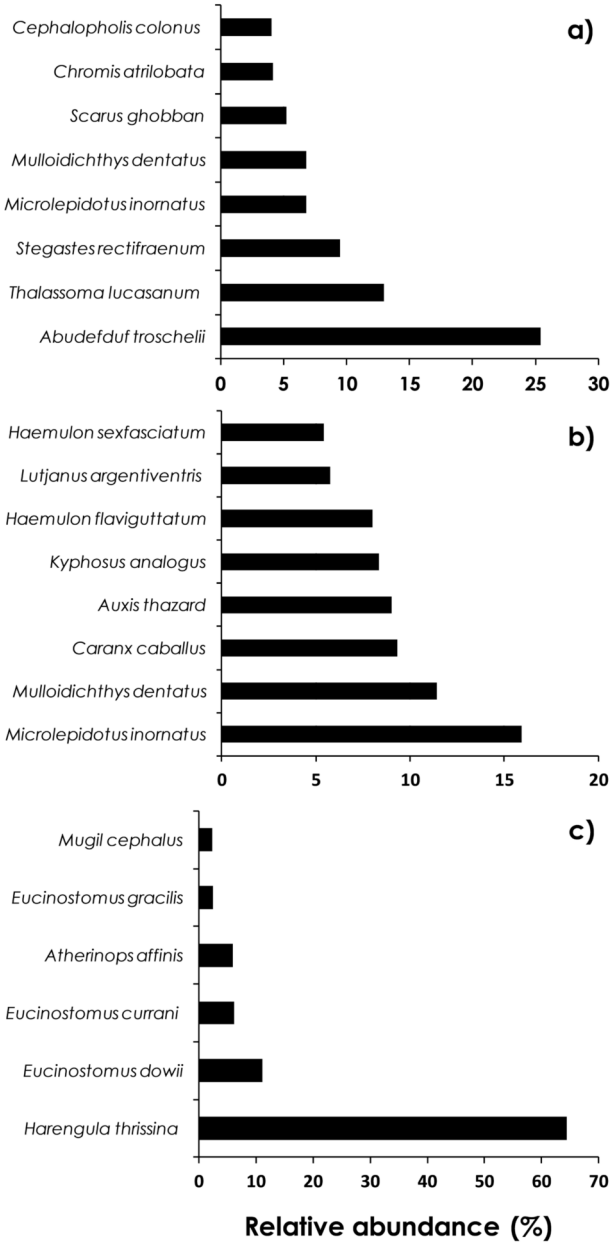

Fig. 2. Relative abundance of the most important fish species from San Jose and San Francisquito Islands, and El Pardito Islet in the southwestern Gulf of California, originally obtained with (a) visual censuses, (b) gill net captures, and (c) charalera net

[*] Full species names featuring the authority and the year are privided in Table 1.
[**] See footnote on page 178.

and Allen 2008). The more diverse family in the Eastern Tropical Pacific, such as Gobiidae with 124 species, was poorly represented in this study, this could be due to several species being endemic to the Panamic Province and oceanic islands, and several being associated to soft bottoms, which is a poorly studied habitat on the islands. Other well represented families in species richness for the region but with few species on the islands were Sciaenidae (82 spp. known in the ETP) and Ariidae (28 spp.), which prefer estuarine and lagoon systems, Cynoglossidae (18 spp.), Triglidae (10 spp.), and Bothidae (9 spp.) which are associated with soft bottoms on the continental platform and are abundant there, as well as Engraulidae (26 spp.) which regularly inhabit estuaries, coastal lagoons and the coastal pelagic zone.

Biogeographically, the Gulf of California is almost entirely within the Cortez Province (Hastings 2000, Robertson and Cramer 2009). Of all recorded species, 24 were endemic to this Province. Most were small sedentary species, associated to reef systems belonging to the families Chaenopsidae (*Acanthemblemaria crockeri*, *A. hastingsi*, *Coralliozetus micropes*, *C. rosenblatti*, *Emblemaria hypacanthus*, *E. walker*, and *Stathmonotus sinuscalifornici*), Gobiidae (*Aruma histrio*, *Barbulifer pantherinus*, *Chriolepis zebra*, *Elacatinus limbaughi*, *Gobiosoma chiquita*, and *Pycnomma semisquamatum*), Labrisomidae (*Malacoctenus hubbs*i, *Starksia cremnobates*, and *Xenomedea rhodopyga*), Tripterygiidae (*Axoclinus nigricaudus* and *Crocodilichthys gracilis*), Gobiesocidae (*Tomicodon boehlkei* and *T. humeralis*), and Dactyloscopidae (*Dactyloscopus pectoralis*). Resident mobile species were also recorded, belonging to the families Kyphosidae (*Girella simplicidens*), and Opistognathidae (*Opistognathus fossoris*), as well as one demersal soft bottom species from the family Ophidiidae (*Ophidion iris*).

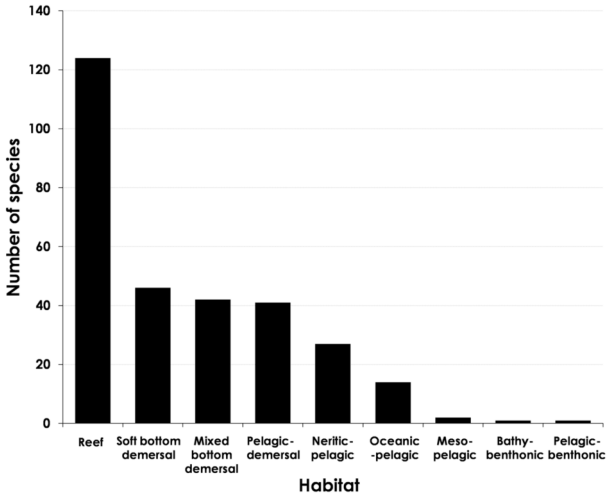

Fig. 3. Preferential habitat of fish species from San Jose and San Francisquito Islands, and El Pardito Islet in the southwestern Gulf of California

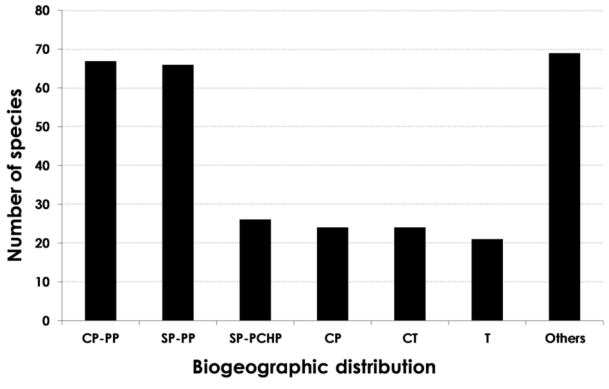

Fig. 4. Ichthyogeographic affinity of recorded species from San Jose and San Francisquito Islands, and El Pardito Islet in the southwestern Gulf of California: SP = San Diego Province; PP = Panamic Province; PCHP = Peruvian-Chilean Province; CP = Cortez Province; CT = Circumtropical; T = Transpacific; others = all other possible combinations

In general, the fish community was dominated by eurythermal tropical species widely distributed in the Eastern Tropical Pacific region (Robertson and Allen 2008). The circumtropical component was well represented by 24 species from varied habitats, including oceanic-pelagic species (e.g., *Carcharhinus falciformis*), pelagic-neritic species (e.g., *Selar crumenophthalmu*), demersal-pelagic species (e.g., *Mugil curema*), mixed bottom demersal species (e.g., *Diodon holocanthus*), and even reef species (e.g., *Fistularia commersonii*). Transpacific species were only represented by reef species (e.g., *Oxycirrhites typus*) and pelagic-neritic species (e.g., *Scomber japonicus*). The majority of species from this group are reef inhabitants and have greater representation along the oceanic islands of the region (Robertson and Allen 1996, Castro-Aguirre and Balart 2002), as well as in the southern Gulf of California and the coast between Costa Rica and Panama (Thomson et al. 2000, Robertson and Allen 2008).

The evaluation of the ichthyofaunal community of these islands using several methods as well as records from bibliographic sources and scientific collections allowed us to create a systematic list with a high species richness; however, this list is still far from being complete, since some environments such as deep reefs, especially on the eastern side of the islands, have been scarcely explored or not at all. Finally, the presence of 20 elasmobranch species (10 sharks and 10 rays) near the islands and of several large species from the families Serranidae (e.g., *Mycteroperca rosacea*), Scaridae (e.g., *Scarus perrico*), and Lutjanidae (e.g., *Hoplopagrus guentherii*) mainly at El Pardito Islet, seems to indicate that the protective measures being carried by the local fisherman and their families that permanently inhabit this islet have contributed positively to fish conservation.

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